Memo to File

Date: July 23, 2012

From: Rick Claytor, CHMM, SETI and Tetra Tech START Team Member, Project Manager for Former United Zinc Removal Action

To: Tetra Tech Site File

Subject: Former United Zinc Site, Iola, Kansas, post excavation details

During the Superfund Technical Assessment and Response Team (START) removal site evaluation and removal action at the abovementioned site, the removal action level for lead concentrations in soil at residential properties was 800 mg/kg. For schools and daycare facilities, and residences where a child with an elevated blood level (EBL) lived, the removal action level was 400 mg/kg. Over the course of START field activities (including the RSE and subsequent removal action), 1,674 properties were screened. START identified 140 properties with lead concentrations greater than the time-critical removal action levels in surface soil. Those properties consisted of two schools, 15 daycare centers, two EBL residences, one church, 117 residential properties, and three commercial properties. In addition, 403 properties were identified with lead concentrations greater than 400 mg/kg but less than 800 mg/kg. At the time, it was determined that those 403 properties will be addressed by EPA at a later time under a non-time-critical removal action. The remaining 1,131 properties were found to have lead concentrations less than 400 mg/kg in surface soil.

During the removal, EPA's Emergency and Rapid Response Services (ERRS) contractor was supplied copies of screening records that START generated to identify the areas of each property that required excavation. If any portion of a property exceeded the action level for lead, all cells on the property that exceeded 400 mg/kg were excavated. Prior to the initiation of any removal activities, a meeting was held with the property owner to review the area(s) to be excavated. At that time, the owner could ask questions and identify vegetation and paved areas preferred to be left undisturbed. Large plants and intact (unbroken) pavement were not removed from properties during the removal activities. To determine when the removal action level had been met, START periodically screened excavated areas with a XRF during removal activities. This allowed the excavation to proceed efficiently, minimizing movement of heavy equipment and "re-digging." Excavation proceeded to a minimum depth of 6 inches, with a maximum depth of 24 inches. By the completion of the removal activities, 20,159 tons of lead-contaminated soil had been transported to the landfill.

Soil sampling was conducted by START in each excavated cell after excavation had been completed. Each post-excavation soil sample consisted of nine aliquots collected and screened in the same manner as the initial screening samples. In most cases, the final excavation depth and the post-excavation XRF readings were recorded on the original screening form for the property. Once the cleanup levels were achieved, the excavated area was backfilled. Clean backfill soil was delivered to each property by the supplying company. The soil was compacted, and grass seed and mulch were applied. Soil used to backfill the excavated areas in fall 2006 was supplied from a nearby quarry. During the spring 2007 activities, backfill soil was obtained from a landowner near the town of Humboldt, Kansas. Soils from both of those areas were screened by START and analyzed by the EPA Region 7 laboratory (sample numbers 3551-12, 3281-16, 3283-1, and 3283-2) to verify that they did not contain elevated concentrations of lead or other heavy metals. During the course of the project, 21,168 cubic yards of clean soil was used to backfill the excavated areas.

The table below notes the depths (6", 12", 18", or 24") of identified properties; if no post excavation information is available on depth, it is noted as "Unknown". Also, the post excavation confirmation screening and/or sampling value is listed below when.

Sample Number	EPA Property ID	Depth of excavation	Post excavation lead results (mg/kg)	References
3001-2 (McKinley Elementary School)	EPA #2, Cell 8	12"	119 XRF	524
3151-1	EPA #270, Cell 2	NA	--	--
3151-2	EPA #64, Cell 1	12"	1150 lab	571
3151-3	EPA #102, Cell 2	12"	704 lab	583
3151-4	EPA #76, Cell 3	6"	285 X	575
3151-5	EPA #183, Cell 1	12"	582 X	587
3151-6	EPA #261, Cell 1	NA	--	--
3151-7	EPA #266, Cell 1	6"	372	611
3151-9	EPA #268, Cell 2	NA	--	--
3152-1	EPA #254, Cell 1	12"	139 X	603
3152-2	EPA #285, Cell 2	NA	--	--
3152-3	EPA #298, Cell 1	NA	--	--
3152-4	EPA #295, Cell 1	12"	808 X	617
3152-5	EPA #274, Cell 2	12"	150 X	613
3152-6 (Jefferson Elementary School)	EPA #3, Cell 7	12 "	539 X	549
3152-7	EPA #297, Cell 1	12"	401 X	619
3152-8	EPA #299, Cell 2	NA	--	--
3152-10	EPA #287, Cell 1	NA	--	--

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Sample Number	EPA Property ID	Depth of excavation	Post excavation lead results (mg/kg)	References
3152-11	EPA #281, Cell 1	NA	--	--
3152-12	EPA #328, Cell 4	NA	--	--
3152-13	EPA #334, Cell 1	NA	--	--
3152-14	EPA #325, Cell 1	NA	--	--
3152-15	EPA #326, Cell 3	NA	--	--
3152-16	EPA #294, Cell 1	NA	--	--
3152-17	EPA #309, Cell 2	12"	192 X	625
3152-19	EPA #314, Cell 3	6"	492 X	627
3152-20	EPA #315, Cell 1	NA	--	--
3153-1	EPA #373, Cell 1	NA	--	--
3153-4	EPA #392, Cell 1	NA	--	--
3153-5	EPA #333, Cell 1	NA	--	--
3153-7	EPA #344, Cell 2	NA	--	--
3153-8	EPA #346, Cell 2	NA	--	--
3153-10	EPA #356, Cell 1	NA	--	--
3153-11	EPA #255, Cell 1	12"	813 X	605
3153-12	EPA #354, Cell 1	NA		
3153-13	EPA #41, Cell 3	12"	1223 X	557
3153-14	EPA #394, Cell 1	NA	--	--
3153-15	EPA #337, Cell 1	NA	--	--
3153-16	EPA #378, Cell 2	12"	383 X	643
3153-17	EPA #341, Cell 1	6"	212 X	637
3154-2	EPA #414, Cell 4	NA	--	--
3154-3	EPA #408, Cell 3	12"	863 X	653
3154-4	EPA #396, Cell 1	NA	--	--
3154-6	EPA #558, Cell 2	NA	--	--
3154-7	EPA #65, Cell 2	12"	521 X	573
3154-8	EPA #541, Cell 2	NA	--	--
3154-9	EPA #411, Cell 1	6"	736 X	655
3154-10	EPA #397, Cell 3	6"	159 X	649
3154-11	EPA #452, Cell 5	12"	169 X	665
3154-12	EPA #467, Cell 4	24"	275 X	667
3154-13	EPA #467, Cell 2	24"	283 X	667
3154-14	EPA #434, Cell 1	NA	--	--
3154-15	EPA #463, Cell 2	NA	--	--
3154-16	EPA #404, Cell 1	NA	--	--
3154-17	EPA #433, Cell 1	NA	--	--
3154-18	EPA #406, Cell 1	NA	--	--
3154-22	EPA #547, Cell 4	NA	--	--
3154-23	EPA #387, Cell 3	NA	--	--
3154-25	EPA #565, Cell 1	12"	257 X	677
3154-26	EPA #579, Cell 2	6"	179 X	679
3154-27	EPA #579, Cell 4	6"	310 X	679
3154-28	EPA #567, Cell 5	NA	--	--
3154-29	EPA #554, Cell 3	NA	--	--
3154-30	EPA #588, Cell 1	NA	--	--
3154-31	EPA #588, Cell 3	NA	--	--
3154-32	EPA #593, Cell 1	NA	--	--
3154-33	EPA #591, Cell 2	NA	--	--

Sample Number	EPA Property ID	Depth of excavation	Post excavation lead results (mg/kg)	References
3154-34	EPA #468, Cell 2	NA	--	--
3154-35	EPA #532, Cell 2	NA	--	--
3155-3	EPA #515, Cell 1	NA	--	--
3155-4	EPA #514, Cell 1	NA	--	--
3155-5	EPA #625, Cell 1	NA	--	--
3155-6	EPA #234, Cell 3	24”	648 X	597
3155-8	EPA #610, Cell 1	NA		
3155-9	EPA #607, Cell 1	12”	227 X	689
3155-10	EPA #659, Cell 1	NA		
3155-11	EPA #234, Cell 2	24”	2403 X	597
3155-12	EPA #601 Cell 1	12”	116 X	685
3155-13	EPA# 664, Cell 1	6”	240 X	709
3155-14	EPA #662, Cell 3	6”	110 X	707
3155-15	EPA #621, Cell 1	6”	274 X	697
3155-16	EPA #553, Cell 6	NA		
3155-17	EPA #658, Cell 1	24”	375 X	705
3155-18	EPA #720, Cell 1	6”	282 X	713
3155-19	EPA #710, Cell 5	NA	--	--
3155-26	EPA #725, Cell 1	NA	--	--
3155-27	EPA #717, Cell 1	NA	--	--
3155-31	EPA #694, Cell 1	NA	--	--
3155-33	EPA #699, Cell 2	NA	--	--
3156-1	EPA #729, Cell 1	NA	--	--
3156-2	EPA #771, Cell 3	6”	325 X	721
3156-3	EPA #748, Cell 1	NA	--	--
3156-4	EPA #739, Cell 2	NA	--	--
3156-5	EPA #755, Cell 4	6”	337 X	717
3156-7	EPA #746, Cell 1	NA	--	--
3156-8	EPA #753, Cell 1	NA	--	--
3156-10	EPA #775, Cell 2	12”	706 X	723
3156-11	EPA #621, Cell 4	6’	274 X	697
3156-12	EPA #781, Cell 1	NA	--	--
3156-13	EPA #647, Cell 4	NA	--	--
3156-14	EPA #632, Cell 3	NA	--	--
3156-15	EPA #648, Cell 2	NA	--	--
3156-16	EPA #651, Cell 3	6”	329 X	701
3156-17	EPA #589, Cell 4	12”	129 X	683
3156-18	EPA #759, Cell 4	12”	272 X	719
3156-19	EPA #443, Cell 1	12’	497 X	663
3156-20	EPA #692, Cell 1	NA	--	--
3156-21	EPA #613, Cell 4	12”	791 X	693
3156-22	EPA #400, Cell 4	NA	--	--
3156-23	EPA #621, Cell 2	12”	569 X	697
3156-24	EPA #793, Cell 3	NA	--	--
3156-25	EPA #750, Cell 1	NA	--	--
3156-26	EPA #810, Cell 4	NA	--	--
3156-27	EPA #446, Cell 3	NA	--	--
3156-28	EPA #764, Cell 2	NA	--	--
3156-29	EPA #417, Cell 1	12”	368 X	659

Sample Number	EPA Property ID	Depth of excavation	Post excavation lead results (mg/kg)	References
3156-30	EPA #796, Cell 1	NA	--	--
3156-32	EPA #806, Cell 1	6"	228 X	725
3156-33	EPA #787, Cell 1	NA	--	--
3156-34	EPA #786, Cell 1	NA	--	--
3156-35	EPA #500, Cell 2	NA	--	--
3156-37	EPA #853, Cell 1	NA	--	--
3157-2	EPA #526, Cell 2	NA	--	--
3157-3	EPA #480, Cell 2	NA	--	--
3157-4	EPA #544, Cell 1	NA	--	--
3157-5	EPA #877, Cell 1	NA	--	--
3157-6	EPA #408, Cell 2	12"	237 X	653
3157-7	EPA #883, Cell 2	NA	--	--
3157-8	EPA #844, Cell 2	NA	--	--
3157-9	EPA #862, Cell 1	NA	--	--
3157-10	EPA #833, Cell 1	NA	--	--
3157-12	EPA #813, Cell 1	NA	--	--
3157-13	EPA #887, Cell 2	12"	808 X	729
3157-14	EPA #505, Cell 1 (Please note: field documentation error in recording EPA #505 as #606)	NA	--	--
3157-15	EPA #611, Cell 3	NA	--	--
3157-16	EPA #668, Cell 2	NA	--	--
3157-17	EPA #907, Cell 1	NA	--	--
3157-18	EPA #919, Cell 3	12"	664 X	733
3158-1	EPA #927, Cell 2	18"	203 X	735
3158-2	EPA #931, Cell 2	12"	351 X	737
3158-3	EPA #965, Cell 1	NA	--	--
3158-4	EPA #982, Cell 1	NA	--	--
3158-5	EPA #975, Cell 2	12"	371 X	747
3158-6	EPA #950, Cell 2	NA	--	--
3158-8	EPA #968, Cell 5	NA	--	--
3158-9	EPA #957, Cell 3	6"	191 X	743
3158-10	EPA #958, Cell 2	6"	362 X	745
3158-11	EPA #998, Cell 1	NA	--	--

Notes:

EPA	U.S. Environmental Protection Agency
ID	Identification
mg/kg	Milligrams per kilogram
NA	not available, no excavation conducted
X	XRF Concentrations
"	inches
Lab	laboratory result

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Kansas Department of Health and Environment

Preliminary Assessment 2

IMP Boats Site
(Lanyon #1 and #2)
Iola, KS

Bureau of Environmental Remediation

PRELIMINARY ASSESSMENT 2

IMP Boats (Lanyon #1 and #2)
Iola, Kansas

Prepared by:
Kansas Department of Health and Environment
Bureau of Environmental Remediation
Remedial Section
Site Assessment Program

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1.0 Introduction

This document presents the findings of a Preliminary Assessment 2 (PA2) conducted by the Kansas Department of Health and Environment (KDHE) at the IMP Boats site in Iola, Kansas. The assessment was conducted as part of continuing cooperative agreement with the United States Environmental Protection Agency (EPA) to perform investigations of selected sites to evaluate potential or actual releases of hazardous substances, pollutants, or contaminants in Kansas. These investigations are performed under the authority of the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA) as amended by the Superfund Amendments and Reauthorization Act (SARA) of 1986 and consistent with the National Oil and Hazardous Substances Pollution Contingency Plan (NCP) 40 CRF § 300.400-300.425.

This PA2 was initiated by the KDHE Bureau of Environmental Remediation (BER) primarily to summarize the existing historical information and analytical data for the IMP Boats site and determine if further action under CERCLA/SARA consistent with the NCP is appropriate. The PA2 included review of historical information, an on-site reconnaissance, an initial evaluation of the site using the Hazard Ranking System (HRS) guidance and "QuickScore" software, and compilation of a comprehensive target survey. This site has the EPA identification number of KSD091356857 and is proposed to be included within the "parent" site of the United Zinc and Associated Smelters Site, KSN000705026. This site is also known as the Lanyon #1 and #2 Site.

2.0 Site Information

2.1 Site Location and Description

The IMP Boats site is located at 500 West Lincoln Road, Iola, Kansas 66749. The site includes commercial and industrial properties along Lincoln and a large vacant lot that contains most of the smelter waste and is approximately bounded by an east-west line 500 feet north of West Lincoln Road, North State Street to the east, a cemetery and agricultural field to the south, and agricultural fields to the west. A former railroad bed is present at the southern edge of the site. The Public Land Survey description of the site is Section 27, Township 24 South, Range 18 East in Allen County, Kansas. Global positioning system (GPS) coordinates of the site boundaries are included in Table 1. The coordinates near the historically highest lead concentrations at the site are 37.92602 north latitude and -095.41302 west longitude. The waste encompasses approximately 20 acres, and it is estimated that an additional 10 to 20 acres outside of the visible waste may also be impacted (References 1, 2, 3, 4, and 5).

2.2 Site Background

Commercial zinc smelters began operation in southeastern Kansas in the late 1870s, originally fueled by local coal deposits. In the 1890s the discovery of natural gas in other areas of southeastern Kansas caused the migration of smelting operations to cities with abundant natural gas wells. In 1896 the sons of Robert Lanyon constructed the original Lanyon #1 and Lanyon #2 smelters on the IMP Boats site, which were the first smelters in the Iola area. In 1899 the Lanyon Zinc Company was formed and later became the largest zinc smelting company in the United States.

Although zinc was the primary metal processed, lead and other metals were also processed from ore mined in the nearby Tri-State mining district of southeastern Kansas, southwestern Missouri and northeastern Oklahoma. Additional KDHE research has revealed that American Metals Company leased Lanyon #1 and #2 smelters beginning in 1910. American Metal Company subsequently became AMAX, Cyprus Amax, and finally Phelps Dodge Corporation. KDHE has initiated negotiations with Phelps Dodge Corporation for this site. Subsequent operators also included J.B. Kirk Gas and Smelting Company and the United States Smelting Company (Reference 1, 2, 3, 4, 5 and 6). The smelter was inactive in the 1920s, and the property was divided and sold into several parcels. IMP Boats operated a boat manufacturing facility on the northern portion of the site until 1992 (Reference 3).

2.3 Previous Investigations

A Phase I Environmental Risk Assessment (ERA) was conducted at the site in 1990, and a Phase II ERA was completed in 1991. During the Phase II several test pits were excavated with a backhoe, and smelter waste was visually observed at several sampling locations. The maximum concentration of lead detected during the Phase II was 42,800 milligrams per kilogram (mg/Kg) at a 0-1 foot interval; the maximum concentration of cadmium was 273 mg/Kg in a 0-1 foot interval; and the maximum concentration of zinc was 47,650 mg/Kg in a 0-1 foot interval. Lead failed the Toxicity Characteristic Leachate Procedure (TCLP) threshold of 5 milligrams per liter (mg/L) with a result of 200 mg/L (Reference 1).

A PA was completed by KDHE in January 1992. Three groundwater samples were collected for the PA and the previous Phase II soil results were summarized. One sample indicated dichloromethane (methylene chloride) at 12.1 micrograms per liter (µg/L), above its Maximum Contaminant Level (MCL) of 5 µg/L. No additional soil or waste samples were obtained during the PA. The PA recommended a Screening Site Inspection (SSI) be completed (Reference 2).

In September 1993 Jacobs Engineering Group, a contractor for EPA Region VII, completed the SSI. During the SSI six on-site and three off-site soil samples were collected. Three sediment samples were also collected. Lead was detected at a maximum of 23,800 mg/Kg, cadmium at 272 mg/Kg, and zinc at 27,300 mg/Kg in soil samples. Arsenic was also detected at a maximum of 820 mg/Kg in soil samples. Four samples failed TCLP for lead, with the maximum detection 85.2 mg/L. Cadmium failed TCLP in one sample at 1.05 mg/L, with a TCLP threshold of 1.0 mg/L. The maximum lead detection in sediment samples was 7,640 mg/Kg, cadmium 296 mg/Kg, arsenic 261 mg/Kg, and zinc 22,400 mg/Kg. A soil sample was obtained in the yard of a trailer house at the northwestern edge of the site that indicated lead at 543 mg/Kg (Reference 3).

Another EPA contractor, Ecology and Environment, Inc., conducted a Removal Site Assessment (RSA) at the IMP Boats site in October 1993. During the RSA 12 additional soil samples were obtained and analyzed with a field-portable X-ray fluorescence (XRF) analyzer. One off site sample was also collected in a nearby park that was below 400 mg/Kg. Lead was detected in laboratory samples at a maximum of 9,340 mg/Kg, zinc at 69,500 mg/Kg, cadmium at 427 mg/Kg, and arsenic at 85.7 mg/Kg during the RSA. The maximum lead concentration by XRF was 37,670. The RSA indicated a site-specific XRF calibration model would be calculated and additional site assessment work scheduled (Reference 4).

In 1997 Kingston Environmental, a contractor for the City of Iola, submitted a "Delineation of Lead-Impacted Soil" for the IMP Boats site dated July 30, 1998. Approximately 73 locations were sampled for XRF analysis along with two background locations. The maximum lead by XRF concentration was 54,593 mg/Kg near the south-central portion of the site (Reference 5).

A summary of figures of results from previous investigations are included in Appendix 10.3. Responsible party searches have been conducted by KDHE have determined that Phelps Dodge/Cyprus Amax to be potentially responsible parties (PRPs) for this site (Reference 6). KDHE has initiated discussions with the PRPs to address this site.

2.4 Hazardous Substance Characteristics

Lead, cadmium, zinc and arsenic are the primary hazardous substances of concern at this site. Information regarding these substances of concern are included in Appendix 10.5.

3.0 Assessment Activities

3.1 Review of Existing Data

Previous analytical results obtained through the Phase II ESA, PA, SSI, and RSA have been summarized above. The most recent soil data appears to be the 1997 delineation sampling results. These are summarized in Section 2.3 above.

3.2 Site Reconnaissance

KDHE personnel Randolph L. Brown visited the site on June 14, 2012. Photographs of current site conditions are included in Appendix 10.2. The site is still covered with extensive areas of slag and smelter waste.

4.0 Groundwater Pathway

4.1 Site Geology

The native soil type at the site is primarily the Zaar silty clay. This soil type is generally deep (more than 80 inches) and formed in shale residuum with a one to three percent slope. This soil type is generally silty clay with low permeability. The soils are underlain by terraces associated with alluvial deposits of the Neosho River and is near the transition from weathered shale of the Pennsylvanian Kansas City Group.

Well logs in the area indicate bedrock at generally 18 feet or shallower in depth (References 1, 2, 3, 4, and 8). Groundwater flow appears to generally be southeast towards the Neosho River reflecting surface topography (Reference 8). Groundwater in the site area is very limited in quantity and quality. Limited groundwater sampling conducted in previous investigations indicated elevated lead and zinc in groundwater (References 1 and 2).

4.2 Groundwater Targets

The groundwater exposure pathway under the HRS is evaluated in part by calculating the number of residents, students, and workers served by water wells located within four miles of the site and determining whether these people are actually or potentially exposed to hazardous substances (Reference 7). There are no public water supply (PWS) wells within four miles of the site, and ten domestic wells were identified within four miles of the site through search of the Kansas Geological Survey WWC-5 database (Reference 8). The median population per household of Allen County, Kansas is 2.36 persons, which calculates to 24 potential drinking water targets associated with domestic wells (Reference 9).

4.3 Groundwater Pathway Conclusions

A release of hazardous substances to groundwater has been documented at the site in previous investigations, but no known drinking water wells are at or near the site. Approximately 24 people would be considered potential drinking water targets under HRS. The groundwater pathway is not expected to be a major pathway of concern at the IMP Boats site from the previous data and lack of targets.

5.0 Surface Water Pathway

5.1 Hydrologic Setting

Surface water runoff flows south towards the Neosho River, approximately ½ mile from the site. Two surface water drainage ditches, one on the north side and one on the south side of the site converge near the southwest corner and flow towards the Neosho River.

5.2 Surface Water Targets

The surface water exposure pathway under HRS is evaluated in part by calculating the number of residents, students, and workers served by surface water intakes located within 15 miles downstream of the site and whether these people are actually or potentially exposed to hazardous substances (Reference 7). The intake for the city of Humboldt, Kansas is located within 15 miles downstream (Reference 10) and approximately 1,816 persons are served from this surface water intake (References 9 and 10). The SSI identified several threatened and endangered species along the surface water pathway including the Neosho madtom, bald eagle, and peregrine falcon (Reference 2).

5.3 Surface Water Pathway Conclusions

No surface water samples were collected during this investigation. An observed release of hazardous substances, pollutants, or contaminants to the surface water pathway was not definitively identified from past data, but sediment samples obtained in drainages flowing from the site indicated elevated levels of lead, zinc and cadmium. Future investigations should include direct sampling of drainages between the site and the Neosho River to determine the extent of surface water/sediment contamination. The population of Humboldt, Kansas is considered to be potential surface water targets in addition to environmental targets along the downstream target distance limit.

6.0 Soil Exposure and Air Pathways

6.1 Physical Conditions

The IMP Boats site is located in an older commercial and residential area of Iola, Kansas. Mid-west Fertilizer now occupies and uses much of the site area north of Lincoln Road, and the former IMP Boats buildings are now leased out to several tenants. The residence sampled for the SSI west of the site on Lincoln Road appeared to be abandoned during the PA2 site reconnaissance. Extensive areas of slag, retorts, and other smelter waste are present in the vacant area between the cemetery and West Lincoln Road.

6.2 Soil Exposure and Air Pathway Targets

The soil exposure pathway under HRS assesses the risks associated with existing surficial contamination (0-2 feet below ground surface) at properties on which people live or work (Reference 7). Surface soil samples collected during previous investigations have repeatedly demonstrated observed releases of lead, cadmium, zinc, and arsenic to surface soil over a significant area of surface soil contamination at the site (References 1, 2, 3, 4, and 5). An estimated 50 people work within or adjacent to known areas of soil contamination or waste, and an estimated 5,988 people live within a one square mile radius of the site (Reference 9). The trailer sampled for the SSI appeared to be abandoned during the field reconnaissance for this PA2.

6.3 Soil Exposure and Air Pathway Conclusions

The HRS soil and air pathways pose a potential threat of exposure at the site (the air pathway of HRS currently addresses outside air only). An observed release of lead, zinc, cadmium, and arsenic is present from review of previous data. A release of hazardous substances to air, while not observed, is likely due to the widespread soil contamination throughout Iola from potential depositional contamination from previous smelter activities as well as disturbance and wind-blown spreading of particulates from smelter waste piles and contaminated soils. An estimated 50 workers are potential targets in addition to the resident population of 5,988 within four miles.

7.0 Removal Considerations

Previous removal site assessments have been conducted at the site. The following conditions consistent with §300.415(b)(1) of the NCP were identified during this PA: (i) Actual or potential exposure to nearby human populations, animals, or the food chain from hazardous substances or pollutants or contaminants; and (iv) High levels of hazardous substances or pollutants or contaminants in soils largely at or near the surface, that may migrate.

8.0 Summary and Conclusions

The IMP Boats site is located in a commercial area near the western city limits of Iola, Allen County, Kansas. The site was initiated after heavy metals were detected in soil and groundwater during multiple investigations. Extensive areas of soil contamination and smelter waste are present. Previous data has been unanimous in documenting releases of lead, arsenic, cadmium and zinc to soil.

The purpose of this PA2 is to provide an updated assessment and data summary reviewing all previous data available for HRS considerations. The IMP Boats site is proposed by EPA as a candidate for HRS evaluation for inclusion to the National Priorities List (NPL). Based on the existing data, the site appears to have eligible conditions for a removal action and/or HRS evaluation for inclusion to the NPL.

9.0 References

1) *Phase II Environmental Risk Assessment Investigation for the Evaluation of Potentially Hazardous Materials, IMP Boats, Inc., Iola, Kansas,* Environmental Engineering Consultants, Inc., 1991.

2) *Preliminary Assessment, IMP Boats Site, Iola, Kansas,* Kansas Department of Health and Environment, Bureau of Bureau of Environment Remediation, January 1992.

3) *Final Screening Site Inspection for IMP Boats, Inc., Iola, Kansas,* Jacobs Engineering Group, Inc., September 1993.

4) *IMP Boats, Inc., Site Assessment,* Ecology and Environment, October, 1993.

5) *IMP Boats Site, Delineation of Lead Impacted Soil,* Kingston Environmental Services, Inc., July 30, 1998.

6) KDHE responsible party search information and other historical files for the IMP Boats Site.

7) United States Environmental Protection Agency, November 1992, *The Hazard Ranking System Guidance Manual,* Publication 9345.1-07.

8) Water well completion records, WWC-5, and other geological maps and reports available at: http://www.kgs.ku.edu/, accessed March 15, 2012.

9) U.S. Census Bureau State and County Quick Facts available at: http://quickfacts.census.gov/gfd/, accessed March 15, 2012.

10) Kansas Department of Health and Environment, *Surface Water Register,* 2004.

11) U.S. Department of Agriculture, *Soil Survey for Allen County, Kansas,* 1978.

12) U.S. Environmental Protection Agency, *Guidance for Performing Preliminary Assessments under CERCLA,* EPA 540/G-91/013, 1991.

13) U.S. Environmental Protection Agency, *Guidance for Performing Site Inspections under CERCLA,* OSWER Directive 9345.1-05, 1992.

14) Kansas Department of Health and Environment, Division of Environment files.

10.0 Appendices

10.1 Tables and Figures

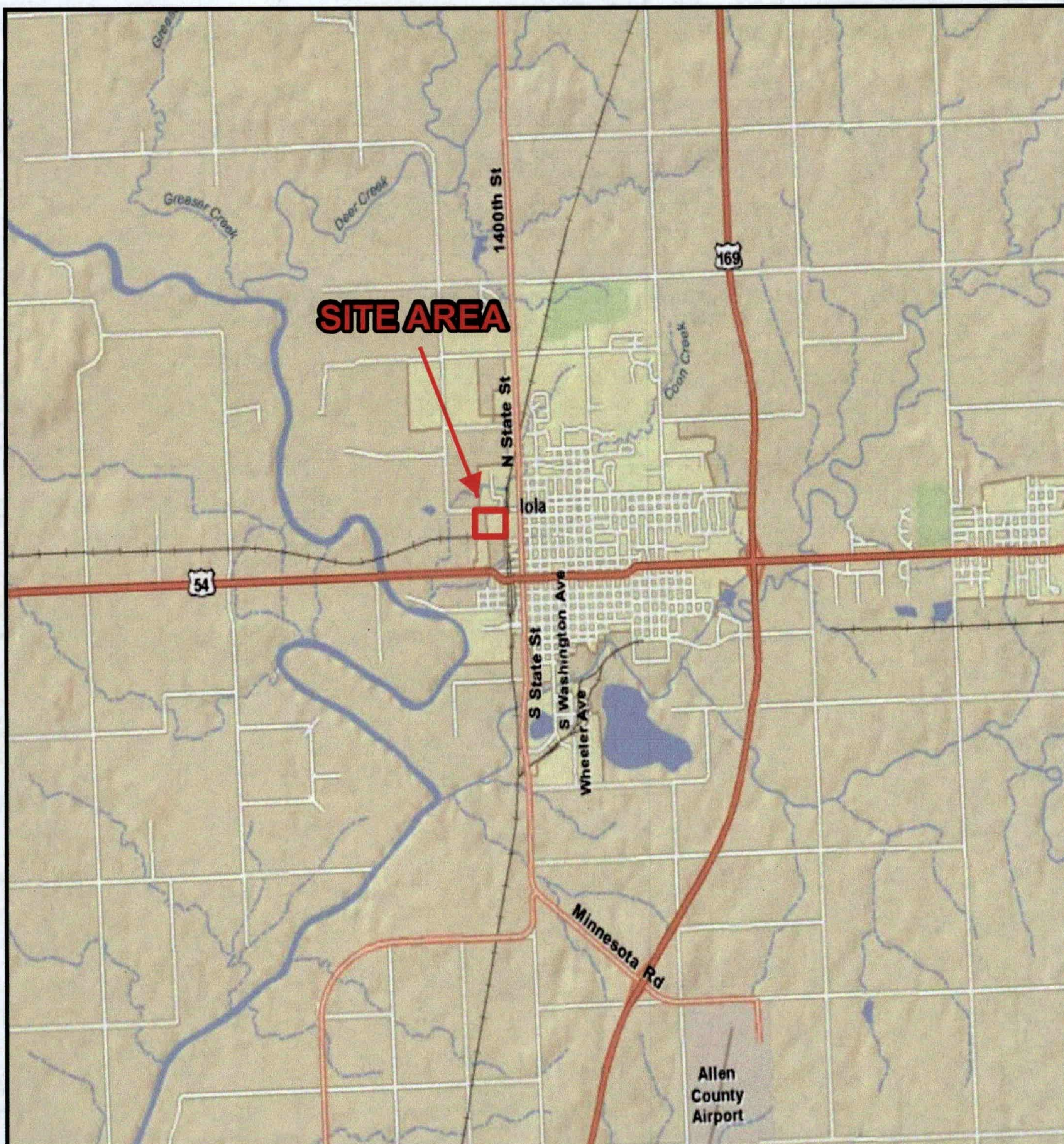
Table 1: Global Positioning System Approximate Coordinates of Site Corners and Large Slag Pile:

Location I.D.	Latitude:	Longitude:
Northeast corner	37.92810	-095.41097
Northwest corner	37.92841	-095.41480
Southeast corner	37.92582	-095.41095
Southwest corner	37.92577	-095.41468
PT-1	37.92602	-095.41302

Table 2: Historical Maximum Concentrations Detected In Soil During Previous Investigations:

Investigation:	Lead (mg/Kg):	Arsenic (mg/Kg):	Cadmium (mg/Kg):	Zinc (mg/Kg):
Phase II Environmental Risk Assessment	42,800	NA	273	47,650
Screening Site Inspection	23,800	820	272	27,300
Removal Site Assessment	9,340	85.7	427	69,500
Lead Delineation Report	54,593	ND	ND	ND
KDHE Residential Tier 2 Risk-based Standards for Kansas	400	11	39	23,500

Notes: NA – not analyzed mg/Kg – milligrams per kilogram



0 1 2 Miles

Allen County

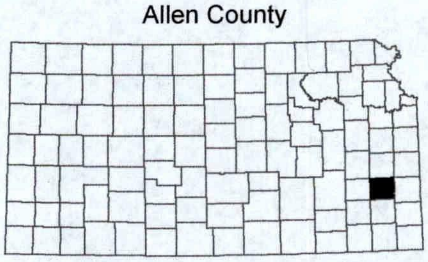


FIGURE 1

Area Map
IMP Boats Site
Iola, Kansas

Kansas Department of Health and Environment

N

Map Prepared by KDHE

Project Manager: RB Drawn by: NS

0 100 200 400 Feet

N

Kansas Department of Health and Environment

LEGEND

Slag Pile

Visible Slag

Site Area

FIGURE 2

Site Outline and Slag Pile
IMP Boats Site
Iola, Kansas

Map prepared by KDHE

2008 aerial photograph

Project Manager: RB

Drawn by: NS

10.2 Photographic Documentation

IMP Boats Site

Photo 1
View: North
Date: 06/14/2012
Photo by: Randy Brown
Comments: IMP Boats site. The area is filled with smelter slag and waste.

Photo 2
View: Northeast
Date: 06/14/2012
Photo by: Randy Brown
Comments: Photo shows large smelter slag pile near center of the site. GPS coordinate PT-1 was obtained in this area.

IMP Boats Site

Photo 3
View: North
Date: 06/14/2012
Photo by: Randy Brown
Comments: Very large fragments of smelter waste near center of the site.

Photo 4
View: Northeast
Date: 06/14/2012
Photo by: Randy Brown
Comments: Photo shows large smelter slag pile near center of the site. Broken retorts, smelter slag and other smelter waste covers the surface throughout this area.

IMP Boats Site

Photo 5
View: North
Date: 06/14/2012
Photo by: Randy Brown
Comments: Photo shows very widespread distribution of smelter waste.

Photo 6
View: South
Date: 06/14/2012
Photo by: Randy Brown
Comments: Photo shows widespread extent of smelter waste towards the southern edge of the site.

10.3 Summary of Analytical Data from Previous Investigations

RECEIVED

AUG 0 3 1998

BUREAU OF
ENVIRONMENTAL
REMEDIATION

IMP BOATS SITE;
CERCLIS ID: KSD091356857
IOLA, KANSAS

DELINEATION OF LEAD IMPACTED SOIL

Prepared for:

City of Iola, Kansas
P.O. Box 308
Iola, Kansas 66749

Prepared by:

Kingston Environmental Services, Inc.
1600 Southwest Market Street
Lee's Summit, Missouri 64081

NOT APPROVED

July 30, 1998

Table of Contents

INTRODUCTION

The IMP Boats site (the Site) is located on approximately 20 acres of land on the west side of the City of Iola, Kansas. Iola is the county seat of Allen County. Figure 1 shows the location of the Site. The Site continues to be used by commercial facilities, however, the current level of activity at the site shows limited use of the facility. Unimproved land which lies generally to the south of the manufacturing facility has been cleared of previous structures, and is partially barren and partially brush covered.

The Site has been the subject of previous investigations by others which identified areas of surficial smelter wastes containing elevated levels of lead. These areas lie generally in the southern half of the Site. The most recent of these investigations was performed by Ecology and Environment, Inc. (E&E) and described in a report dated March 14, 1994. The E&E investigation identified, using both field and laboratory methods, areas of lead contamination in the surficial soils at the Site. Field screening of surficial soil by XRF revealed a range of lead content from 37,670 ppm to less than 100 ppm.

E&E used the data to construct a map of the Site containing topographical contour lines as well as lead concentration isopleth lines indicating areas of the site impacted within a range of values for lead content determined by the field screening methodologies. The investigation also included some *very* limited TCLP soil screening.

In December 1997, Kingston prepared a Work Plan to further delineate the extent of lead impacted soil. Kingston used the information from the E&E report to show the areas identified by E&E as containing more than 1,000 ppm total lead. Kansas Department of Health & Environment (KDHE) reviewed the Work Plan and review comments were incorporated into the Work Plan by letters dated January 9, January 20, February 20, March 31, and April 23, 1998.

The following remedial action goals were incorporated into the Work Plan:

- Areas with total lead concentration of less than 1,000 ppm will remain with no further action.

- Areas that contain total lead concentration greater than 1,000 ppm but pass the TCLP (less than 5 mg/l) will require a soil cover. The depth and extent of the soil cover is to be determined after the investigation is complete.

- Areas that fail the TCLP (5.0 mg/l or greater) will require remediation. Kingston and the Site owners will discuss remedial options with KDHE after such areas are identified.

FIELD ACTIVITIES

Kingston Environmental Services mobilized at the Site and began implementing the approved Work Plan May 4, 1998.

Survey Sample Locations

Kingston retained the services of Shetlar Griffith Shetlar, Inc., a local survey company, a Division of Shafer, Kline & Warren, Inc, (SKW), to survey the sample locations. The locations were staked in accordance with the requirements of the Work Plan. The locations were established on a 100 ft grid pattern and assigned a station number that provides a unique sample identification and location number for each soil sample. Some sample locations were not set on a 100 ft grid pattern. However, these points were established using the established survey system. SKW established a reference baseline parallel and offset 120 feet north of the north building line (2nd building to the east). The baseline is approximately the center line of West Lincoln Road. The reference baseline was assigned the coordinates of station 15+10 N. A 90-degree angle was turned to establish the east/west stationing. A wire flag was set at each location and the sample number was placed on the flag. Sample location distances were established by SKW using a laser and prism system. Figure 2 shows the locations of all sample points. Two background samples were also collected. One background sample was collected in the tilled field directly east of the cemetery (IBG-1). The other background sample (IBG-2) was located on the northern right-of-way of West Lincoln Road near the underground petroleum line marker.

Sample Collection and Preparation

Sample collection and preparation was completed in accordance with the approved Work Plan. A brief summary of collection and preparation procedures are as follows:

- At each location a "sharpshooter" type shovel was used to excavate a hole approximately 6 inches in diameter from land surface to approximately 6 inches deep.

- A new clean disposable laboratory grade spoon and new disposable latex gloves were used to collect a sample at each location by uniformly scraping the sides and bottom of the hole. A sufficient amount of soil was removed and placed in a sealable plastic bag.

- Each plastic bag was a 1 quart zipper seal 1.75 mil bag. The sample location (station number) was marked on each bag and delivered to a central location for preparation.

- The soil was removed from each plastic bag and placed on individual pieces of aluminum foil. Each sample was allowed to dry in the sun and/or placed in a toaster oven to minimize the moisture content of the sample.

- After being dried the sample was pulverized with a mortar and pistol. The sample was then sieved using a No. 10 (.0787 inches) sieve. The sieved soil was then placed in a 4 oz laboratory-prepared glass sample container with a Teflon lid and the sample location/station number was marked on the sample jar.

- The 4 ounces of soil was then returned to its plastic bag for XRF analysis. After XRF analysis, the 4 ounces of soil was returned to the glass jar for possible laboratory analyses.

- Equipment cleaning and disposal was completed in accordance with the Work Plan.

XRF Field Screening

XRF field screening for soil lead content was conducted using a MAP 4 Spectrum Analyzer (Appendix A). The MAP 4 uses X-ray fluorescence (XRF) to test for lead. The MAP 4 is a hand held, field portable XRF that uses a cobalt-57 radioactive source to energize the sample material.

The detection range of the MAP 4 is 10 to 100,000 parts per million (ppm). The exact lower detection limit of the MAP 4 at a particular site depends on the source of gamma rays used, the amount of interference from other elements present in the soil, the type of matrix of the sample, and the heterogeneity of the soil.

At each sampling location, 3 assays were conducted (on the bagged sample) to obtain the reported value. The level of precision for the testing performed was obtained through operating the XRF in the test mode level of precision (60 sec.). The accuracy of the XRF in the test mode level of precision is $\pm$ 20%, although selected sampling locations greater than 800 ppm and less than 1,200 ppm were reanalyzed using the confirm mode ($\pm$ 10%) of precision.

Field notes of the XRF analyses are included in Appendix A. Figure 2 shows the results of the XRF field screening results.

LABORATORY CONFIRMATION SAMPLES

Laboratory confirmation samples were analyzed for TCLP-Lead, using EPA method 1310, and total lead using method 6010. The confirmation samples were collected to statistically compare the field results with laboratory analysis to develop a correlation between the XRF results vs. total lead laboratory results, and XRF results vs. the TCLP results. The two background samples were analyzed for total lead only.

All samples were logged on a chain of custody form and shipped to AM Laboratories in Olathe, Kansas for analysis. AM Laboratories is a KDHE certified laboratory. Twenty (20) confirmation samples were collected for laboratory analyses. These 20 samples were selected as follows:

- Four (4) samples with the highest total lead (XRF)concentrations.
- Four samples with total lead concentrations nearest to 1,000 ppm.
- Four samples with total lead concentrations nearest to the average concentration between the highest concentration and the 1,000 ppm.
- The remaining eight samples were selected to identify data gaps and provide a better correlation between the XRF results and TCLP lead.

The samples not selected for analyses were shipped to the laboratory "on hold" pending results of the twenty (20) samples.

DATA REDUCTION, ANALYSIS, AND FINDINGS

Table 1 provides a summary of all XRF results, laboratory total lead results, and laboratory TCLP results. AM Laboratories' analytical reports are included in Appendix B.

Kingston completed linear regressions using the least squares method to graphically construct correlation coefficient curves showing the TCLP data vs. the XRF soil lead content, and also comparing total lead in soil data vs. XRF total lead results. Using this data, a determination of a point on the XRF total soil lead content curve was made to indicate at what point in the XRF data the soil would begin to fail the TCLP test (5 ppm lead in the leachate) and also at what point in the XRF data the soil would exceed a laboratory confirmation for total lead concentrations of 1000 ppm.

Kingston performed this correlation for two sets of data. One set was for all twenty sample points analyzed by AM Laboratory. The second set was using only sixteen (16) of twenty (20) laboratory analytical results. The four highest laboratory concentrations were not included in this linear regression.

Graphs of the correlation for both sets of data points are included in Appendix C. Included on the graphs are summaries of the relevant data for each correlation. As shown on the graph for the 20 point correlation, the equivalent XRF result for which the total lead concentration is above 1,000 ppm and the TCLP result is above 5 ppm is 1,988 ppm and 7,860 ppm respectively. Using the 16 point correlation, the equivalent XRF results for which the total lead concentrations are above 1,000 ppm and the TCLP results are above 5 ppm are 3,190 ppm and 16,690 ppm, respectively. For reasons discussed in the Conclusions Section of this report, Kingston believes the 16 point correlation provides the best correlation.

Figure 3A indicates the sample locations and the XRF results that, based on the 20 point correlation, will yield an equivalent total lead concentration above 1,000 ppm. Figure 3B indicates the sample locations and the XRF results that, based on the 16 point correlation, will yield an equivalent total lead concentration above 1,000 ppm. Figure 4A indicates the sample locations and the XRF results that, based on the 20 point correlation, will yield an equivalent TCLP concentration above 5 ppm. Figure 4B indicates the sample locations and the XRF results that, based on the 16 point correlation, will yield an equivalent TCLP concentration above 5 ppm.

SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS

Summary

Data analysis, interpretation, calculations, and recommendations have been reviewed internally by Kingston engineers and scientists prior to release in draft form. Based on this we have developed the following summary and conclusions:

- Soil samples were collected at 73 locations (previously identified by E&E as greater than 1,000 ppm). Background samples were also collected at two additional locations.

- Soil samples were prepared in general conformance with method 6200.

- Soil samples were analyzed in accordance with the approved Work Plan using our MAP 4 Spectrum Analyzer to complete the XRF sample analysis.

- Based on the XRF results, 20 samples were selected and forwarded to AM Laboratories for analyses for total lead and TCLP lead. The two background samples were analyzed for total lead only. The remainder of the samples (53) were shipped to AM Laboratories and placed "on hold".

- Kingston completed linear regressions using least squares methods for XRF vs. laboratory total lead and XRF vs. TCLP. Kingston completed linear regressions for all of the 20 points and also for 16 points eliminating the highest four (4) samples.

Conclusions

- Reviews of Figures 3A and 3B do not indicate a significant difference between the 16 and 20 point correlations for total lead concentrations above 1000 mg/kg.

- Review of Figures 4A and 4B does indicate a significant difference between the 16 point and 20 point correlations for TCLP concentrations above 5 mg/l.

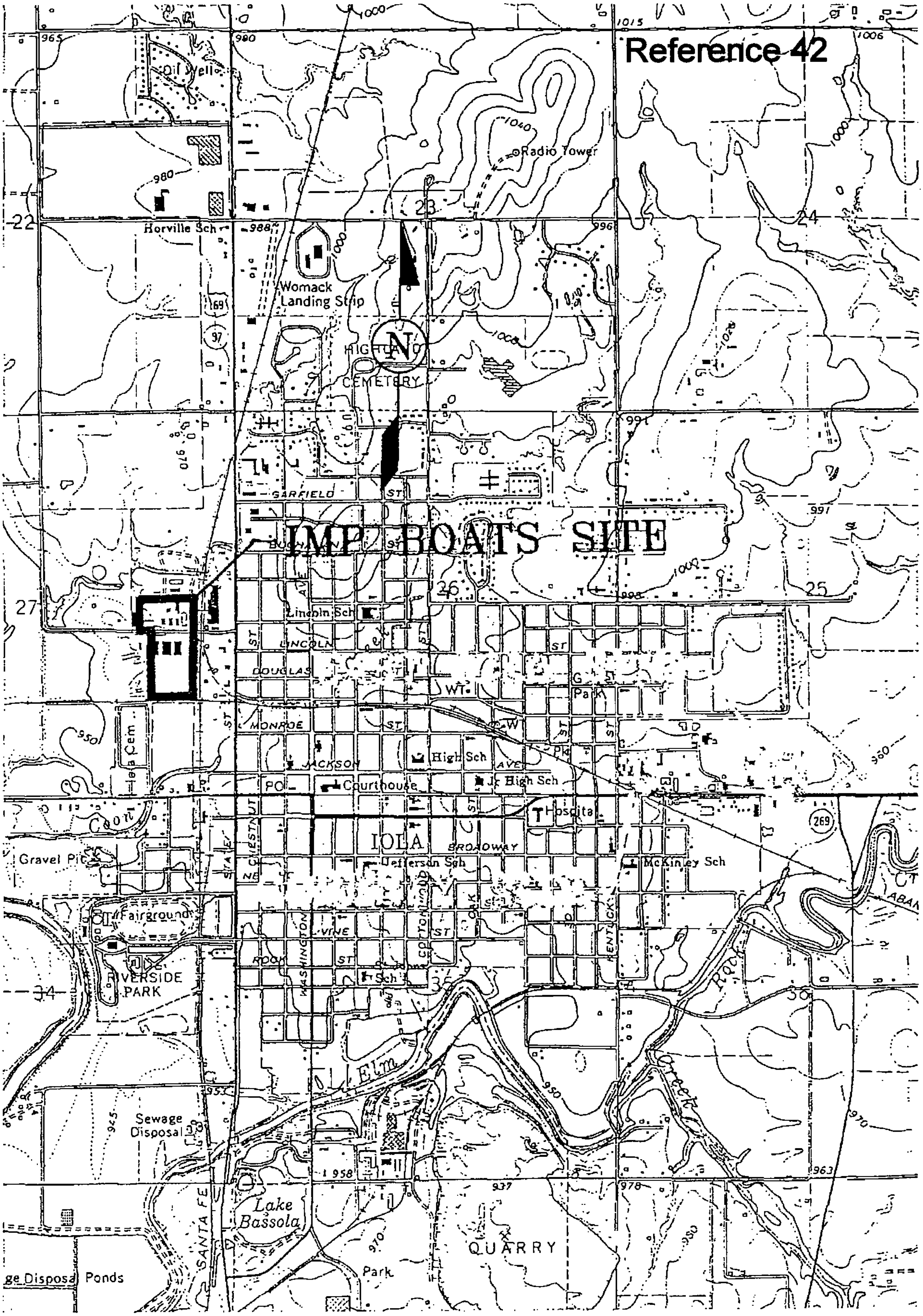
- Based on this information, it is clear that XRF results in the range of 20,000 ppm and above will require corrective action. However, inclusion of these high results (greater than 20,000 ppm) may not provide the best correlation of all sample results. Inclusion of the high results skews the correlation. Furthermore, it may be more appropriate to develop a correlation for sample results that are in the range of concentrations near the 5 mg/l TCLP. Review of Table 1 results indicates that of the 16 samples with XRF concentrations below 16,690 and where comparative TCLP results are available, only two (2) of the TCLP concentrations are above 5 mg/l.

- Analytical results of the two (2) background samples indicate that total lead occurs at elevated concentrations offsite of the IMP Boats site. These results are consistent with information presented in previous investigations and from conversations with individual familiar with Iola history. Apparently elevated lead in soil including cinder material is present at may locations throughout Iola.

Recommendations

Based on remedial action goals initially developed by KDHE, and preliminary cost estimates completed by Kingston, remediation using traditional methods will be cost prohibitive.

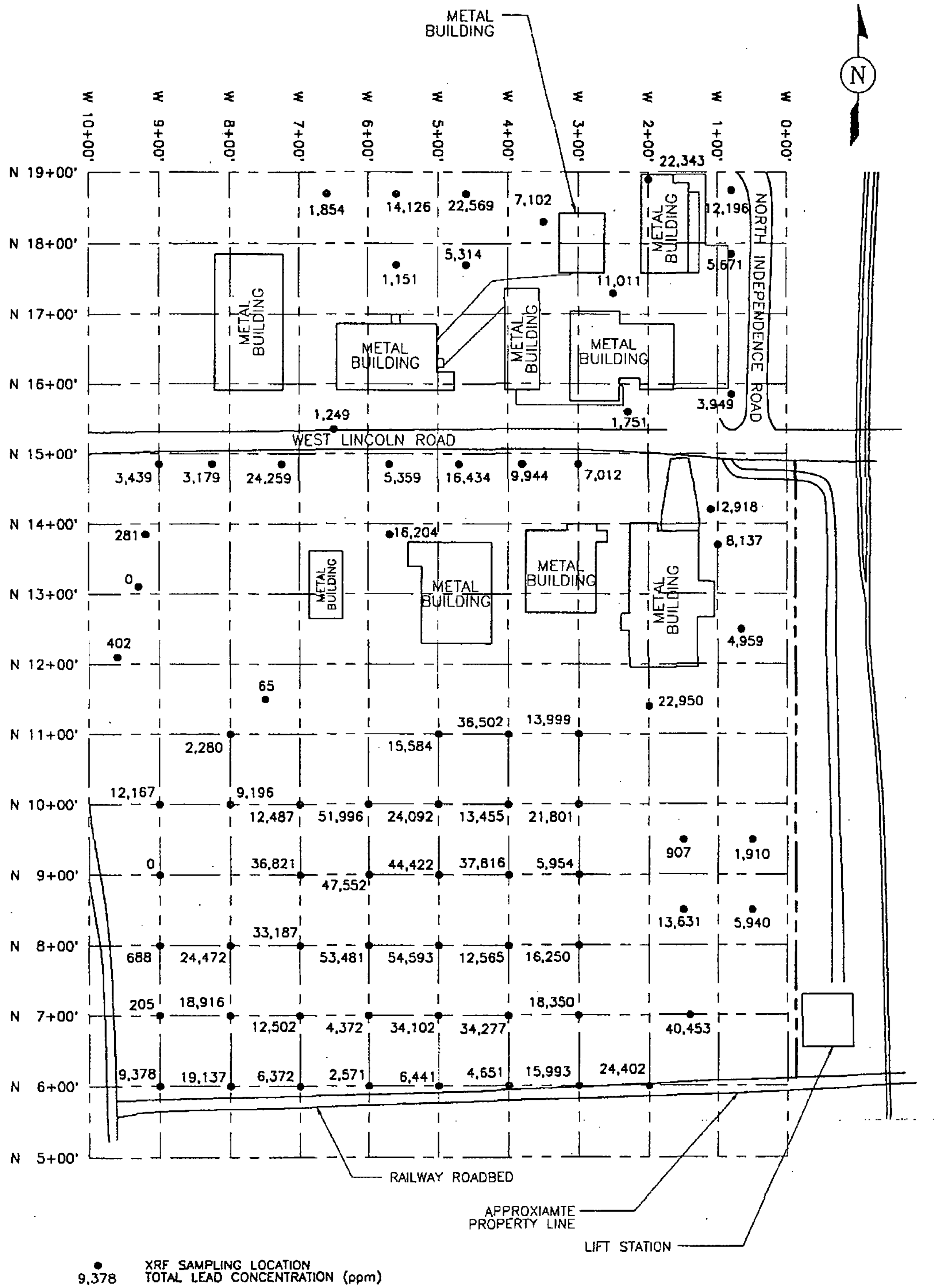
Reference 42



1" = 2000'	DRAWN BY: J.N.C.	SITE LOCATION MAP IMP BOATS, INC. IOLA, KS
DATE: 11-25-97	FIGURE #1	
DWG. #: 775-1		
PROJ. #: 97R850		

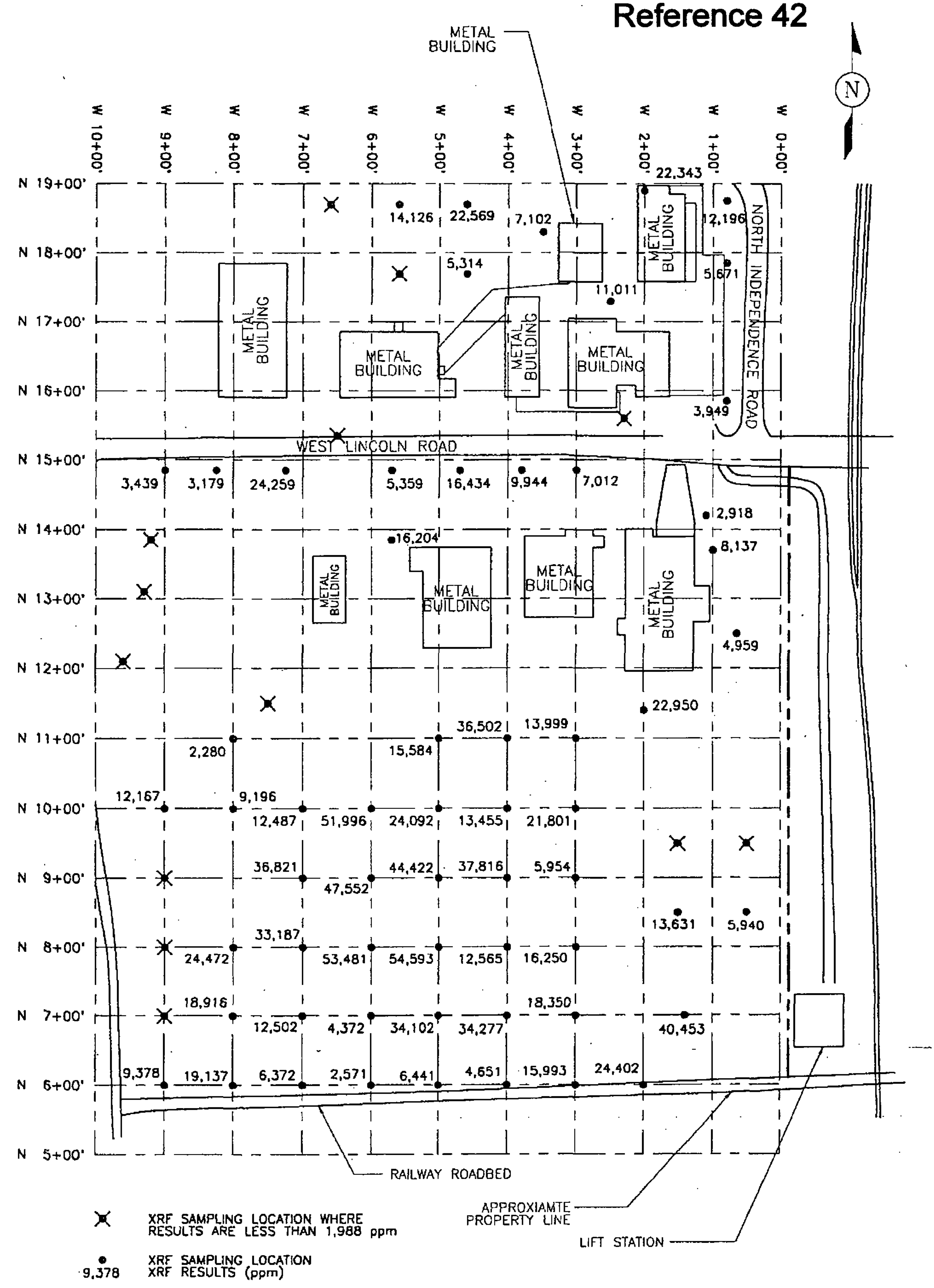
Kingston Environmental Services
1600 S.W. Market
Lee's Summit, Mo. 64081 (816) 524-8811

Reference 42



1" = 200'	DRAWN BY: J.N.C.	SAMPLE LOCATION & XRF RESULTS MAP	Kingston Environmental Services
DATE: 6-5-98	FIGURE #2	IMP BOATS, INC.	1600 S.W. Market
DWG. #: 1112-2		IOLA, KS	Lee's Summit, Mo. 64081 (816) 524-8811
PROJ. #: 97R850			

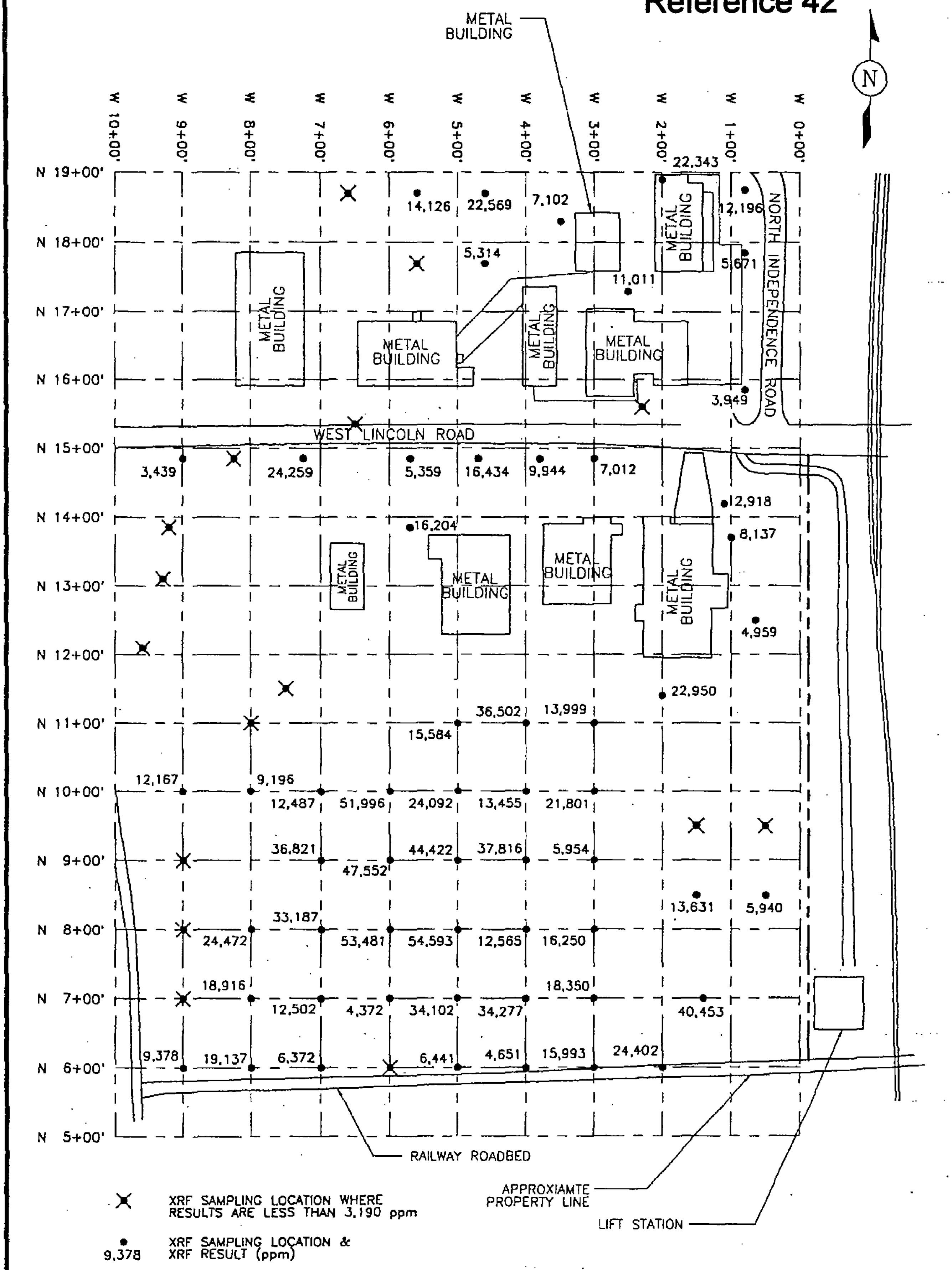
Reference 42



1" = 200'	DRAWN BY : J.N.C.	CORRELATION RESULTS BETWEEN XRF & LABORATORY TOTAL LEAD CONCENTRATIONS (20 POINT)
DATE : 6-5-98	FIGURE #3A	
DWG. # : 1112-3A		IMP BOATS, INC.
PROJ. # : 97RB50		IOLA, KS

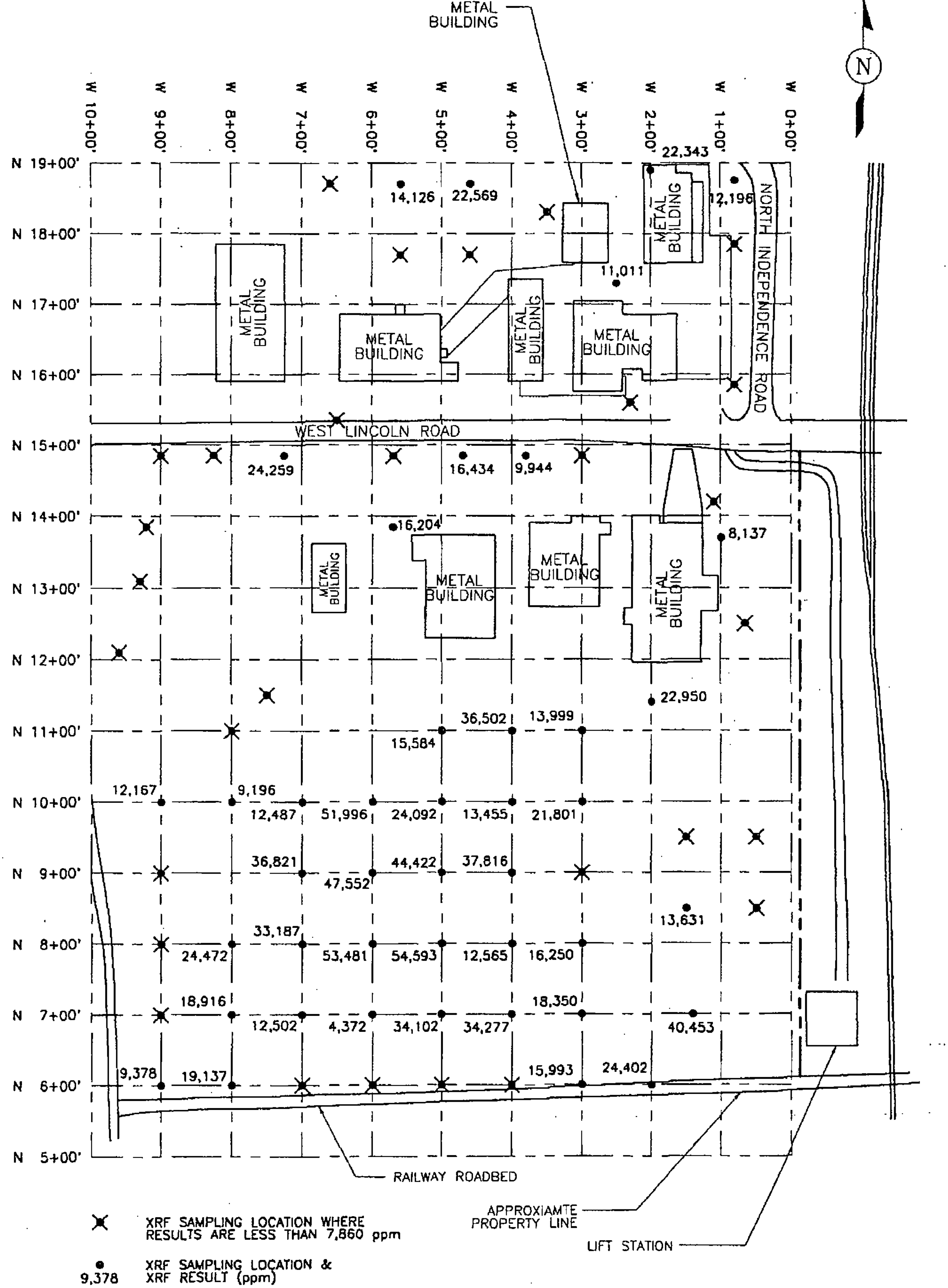
Kingston Environmental Services
1600 S.W. Market
Lee's Summit, Mo. 64081 (816) 524-8811

Reference 42

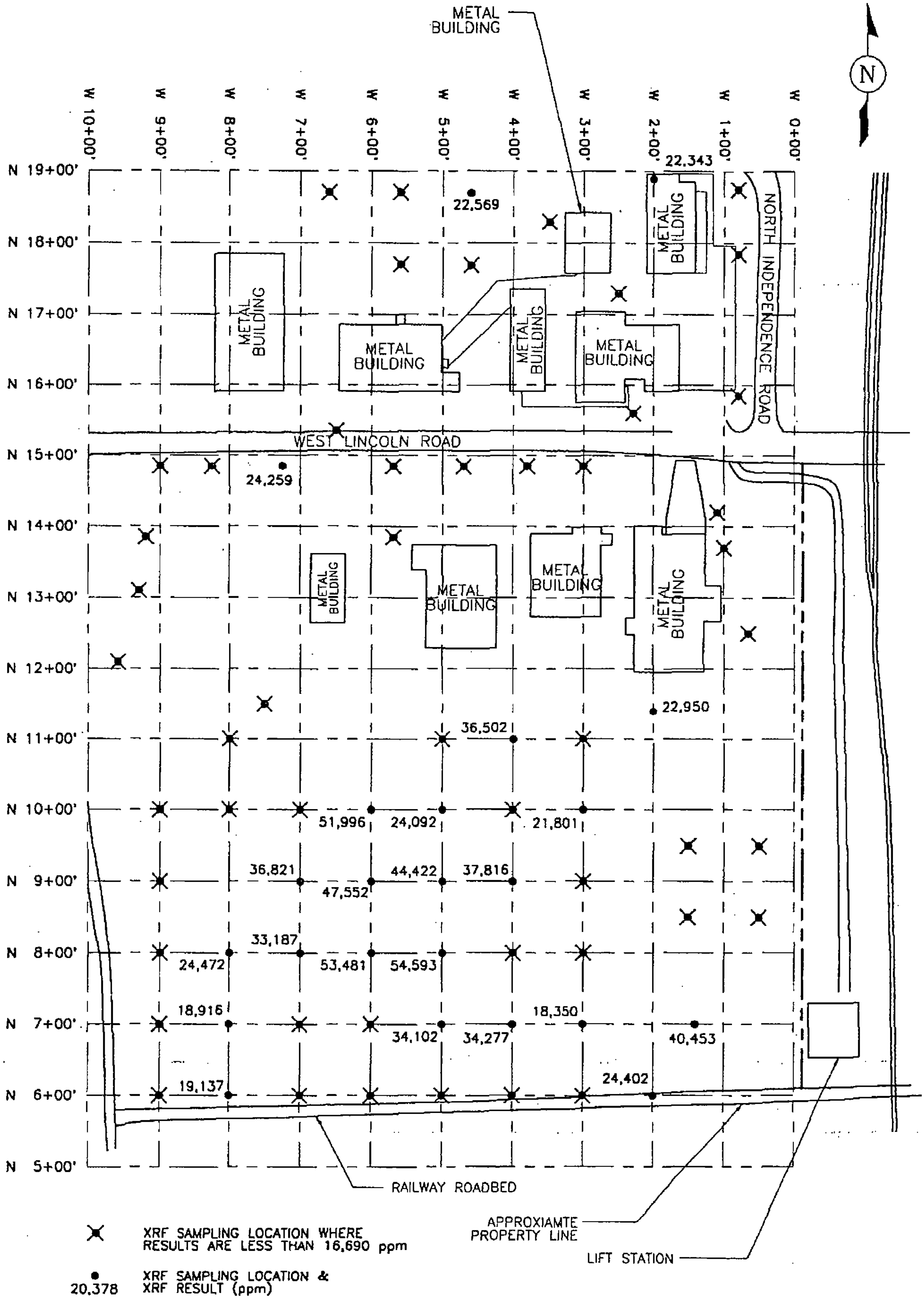


1" - 200'	DRAWN BY: J.N.C.	CORRELATION RESULTS BETWEEN XRF & LABORATORY TOTAL LEAD CONCENTRATIONS (16 POINT)
DATE: 6-5-98	FIGURE #3B	
DWG. #: 1112-3B		IMP BOATS, INC.
PROJ. #: 97R850		IOLA, KS

Kingston Environmental Services
1600 S.W. Market
Lee's Summit, Mo. 64081 (816) 524-8811



1" = 200'	DRAWN BY: J.N.C.	CORRELATION RESULTS BETWEEN XRF & LABORATORY TCLP CONCENTRATIONS (20 POINT)	Kingston Environmental Services
DATE: 6-5-98	FIGURE #4A		
DWG. #: 1112-4A		IMP BOATS, INC. IOLA, KS	1600 S.W. Market Lee's Summit, Mo. 64081 (816) 524-8811
PROJ. #: 97R850			



1" = 200'	DRAWN BY: J.N.C.	CORRELATION RESULTS BETWEEN XRF & LABORATORY TCLP CONCENTRATIONS (16 POINT)
DATE: 6-5-98	FIGURE #4B	IMP BO[illegible] IOLA, KS
DWG. #: 1112-4B		Kingston Environmental Services 1600 S.W. Market Lee's Summit, Mo. 64081 (816) 524-8811
PROJ. #: 97R850		

TABLE 1
SOIL SAMPLE RESULTS SUMMARY
IMP BOATS SITE
CERCLIS I.D. KSD091356857

Assay #	Sample Point	K-Shell Results (ppm)	K-Shell Average (ppm)	TCLP Results (mg/L)	Total Lead (ppm)
1	Calibration	4,069	3,755		
2		3,723			
3		3,429			
4		3,832			
5		3,721			
6	14+85N/7+25W	23,934	24,259		
7		24,252			
8		24,590			
9	14+85N/5+70W	5,472	5,359		
10		5,286			
11		5,319			
12	14+85N/3+00W	7,273	7,012		
13		7,024			
14		6,740			
15	14+85N/8+25W	3,148	3,179	0.381	1,010
16		3,202			
17		3,187			
18	14+85N/4+70W	16,393	16,434		
19		16,449			
20		16,459			
21	14+85N/3+80W	9,957	9,944		
22		9,905			
23		9,971			

TABLE 1
SOIL SAMPLE RESULTS SUMMARY
IMP BOATS SITE
CERCLIS I.D. KSD091356857

Assay #	Sample Point	K-Shell Results (ppm)	K-Shell Average (ppm)	TCLP Results (mg/L)	Total Lead (ppm)
24	14+85N/9+00W	3,571	3,439	0.361	1,800
25		3,217			
26		3,529			
27	12+10N/9+60W	308	402		
28		485			
29		412			
30	13+85N/5+70W	16,279	16,204		
31		16,180			
32		16,153			
33	11+50N/7+50W	19	65		
34		- 358			
35		404			
36	14+20N/1+10W	2,606	2,918	0.572	792
37		2,946			
38		3,201			
39	13+10N/9+30W	- 569	- 0 -		
40		- 540			
41		- 166			
42	13+85N/9+20W	258	281		
43		315			
44		- 8			
45	13+70N/1+00W	8,206	8,137		
46		8,009			
47		8,197			

TABLE 1
SOIL SAMPLE RESULTS SUMMARY
IMP BOATS SITE
CERCLIS I.D. KSD091356857

Assay #	Sample Point	K-Shell Results (ppm)	K-Shell Average (ppm)	TCLP Results (mg/L)	Total Lead (ppm)
48	12+50N/0+65W	5,107	4,959	1.63	1,070
49		4,844			
50		4,925			
51	Post-Calibration	3,850	3,741		
52		3,870			
53		3,503			
54	Pre-Calibration	3,907	3,935		
55		4,449			
56		3,735			
57		3,671			
58		3,914			
59	15+35N/6+50W	1,308	1,249	0.474	344
60		1,239			
61		1,199			
62	15+85N/0+80W	3,785	3,949		
63		4,055			
64		4,008			
65	15+60N/2+30W	1,752	1,751		
66		1,742			
67		1,759			
68	17+85N/0+80W	5,522	5,671		
69		5,707			
70		5,784			

TABLE 1
SOIL SAMPLE RESULTS SUMMARY
IMP BOATS SITE
CERCLIS I.D. KSD091356857

Assay #	Sample Point	K-Shell Results (ppm)	K-Shell Average (ppm)	TCLP Results (mg/L)	Total Lead (ppm)
71	17+30N/2+50W	11,123	11,011	1.61	4,880
72		11,087			
73		10,824			
74	18+75N/0+80W	12,482	12,196		
75		12,057			
76		12,048			
77	18+30N/3+50W	7,341	7,102	0.986	3,540
78		7,075			
79		6,890			
80	11+40N/2+00W	22,931	22,950		
81		23,161			
82		22,759			
83	18+90N/2+00W	22,385	22,343		
84		22,205			
85		22,439			
86	Calibration	4,008	3,690		
87		3,736			
88		3,362			
89		3,651			
90		3,693			
91	18+70N/4+60W	22,824	22,569		
92		22,430			
93		22,453			

TABLE 1
SOIL SAMPLE RESULTS SUMMARY
IMP BOATS SITE
CERCLIS I.D. KSD091356857

Assay #	Sample Point	K-Shell Results (ppm)	K-Shell Average (ppm)	TCLP Results (mg/L)	Total Lead (ppm)
94	18+70N/6+60W	1,615	1,854		
95		1,865			
96		2,084			
97	17+70N/4+60W	5,447	5,314		
98		5,134			
99		5,361			
100	18+70N/5+60W	13,932	14,126	3.23	6,840
101		14,124			
102		14,321			
103	17+70N/5+60W	1,136	1,151	0.103	156
104		1,249			
105		1,069			
106	Calibration	4,391	3,635		
107		3,546			
108		3,198			
109		3,398			
110		3,641			
111	8+00N/9+00W	698	688		
112		580			
113		786			
114	11+00N/3+00W	13,878	13,999	7.58	8,010
115		14,286			
116		13,833			

TABLE 1
SOIL SAMPLE RESULTS SUMMARY
IMP BOATS SITE
CERCLIS I.D. KSD091356857

Assay #	Sample Point	K-Shell Results (ppm)	K-Shell Average (ppm)	TCLP Results (mg/L)	Total Lead (ppm)
117	10+00N/3+00W	21,867	21,801		
118		21,778			
119		21,757			
120	10+00N/9+00W	11,882	12,167	6.80	6,060
121		12,457			
122		12,161			
123	10+00N/6+00W	51,889	51,996		13,000
124		52,041			
125		52,059			
126	10+00N/8+00W	9,031	9,196		
127		9,267			
128		9,291			
129	11+00N/8+00W	608	759	0.065	320
130		992			
131		677			
132	10+00N/4+00W	12,998	13,455		
133		13,391			
134		13,975			
135	6+00N/9+00W	9,537	9,378		
136		9,463			
137		9,135			
138	10+00N/5+00W	24,141	24,092		
139		24,444			
140		23,690			

TABLE 1
SOIL SAMPLE RESULTS SUMMARY
IMP BOATS SITE
CERCLIS I.D. KSD091356857

Assay #	Sample Point	K-Shell Results (ppm)	K-Shell Average (ppm)	TCLP Results (mg/L)	Total Lead (ppm)
141	7+00N/9+00W	43	205		
142		270			
143		- 108			
144	10+00N/7+00W	12,777	12,487		
145		12,858			
146		11,827			
147	11+00N/4+00W	36,629	36,502		
148		36,685			
149		36,191			
150	9+00N/9+00W	- 294	- 0 -		
151		- 216			
152		- 325			
153	8+50N/0+50W	5,490	5,940		
154		5,738			
155		6,591			
156	11+00N/5+00W	15,804	15,584	4.11	6,330
157		15,531			
158		15,417			
159	Post-Calibration	3,861	3,783		
160		3,746			
161		3,741			

TABLE 1
SOIL SAMPLE RESULTS SUMMARY
IMP BOATS SITE
CERCLIS I.D. KSD091356857

Assay #	Sample Point	K-Shell Results (ppm)	K-Shell Average (ppm)	TCLP Results (mg/L)	Total Lead (ppm)
162	Pre-Calibration	3,865	3,857		
163		4,296			
164		3,117			
165		4,097			
166		3,909			
167	9+00N/5+00W	44,396	44,422		
168		44,379			
169		44,490			
170	9+00N/3+00W	6,299	5,954	3.90	1,090
171		5,895			
172		5,669			
173	8+00N/5+00W	54,605	54,593	199	22,500
174		54,502			
175		54,672			
176	8+00N/3+00W	16,274	16,250		
177		16,355			
178		16,121			
179	9+50N/0+50W	2,333	1,910	0.179	332
180		1,684			
181		1,714			
182	8+00N/4+00W	12,644	12,565		
183		12,515			
184		12,535			

TABLE 1
SOIL SAMPLE RESULTS SUMMARY
IMP BOATS SITE
CERCLIS I.D. KSD091356857

Assay #	Sample Point	K-Shell Results (ppm)	K-Shell Average (ppm)	TCLP Results (mg/L)	Total Lead (ppm)
185	9+00N/6+00W	47,539	47,552	62.9	24,600
186		47,515			
187		47,602			
188	9+00N/7+00W	36,586	36,821		
189		37,020			
190		36,858			
191	9+00N/4+00W	37,761	37,816		
192		37,773			
193		37,915			
194	8+00N/6+00W	53,444	53,481	218	19,000
195		53,542			
196		53,458			
197	8+00N/7+00W	33,158	33,187		
198		33,242			
199		33,161			
200	9+50N/1+50W	1,175	907		
201		736			
202		809			
203	8+00N/8+00W	24,386	24,472		
204		24,566			
205		24,482			

TABLE 1
SOIL SAMPLE RESULTS SUMMARY
IMP BOATS SITE
CERCLIS I.D. KSD091356857

Assay #	Sample Point	K-Shell Results (ppm)	K-Shell Average (ppm)	TCLP Results (mg/L)	Total Lead (ppm)
206	8+50N/1+50W	13,467	13,631		
207		13,935			
209		13,492			
210	Post-Calibration	3,225	3,662		
211		3,808			
212		3,954			
213	Pre-Calibration	4,386	4,136		
214		3,842			
215		4,653			
216		4,388			
217		3,411			
218		3,579			
219	6+00N/7+00W	6,412	6,372		
220		6,218			
221		6,486			
222	6+00N/6+00W	2,610	2,571		
223		2,567			
224		2,537			
225	7+00N/8+00W	18,247	18,916		
226		17,932			
227		18,408			

TABLE 1
SOIL SAMPLE RESULTS SUMMARY
IMP BOATS SITE
CERCLIS I.D. KSD091356857

Assay #	Sample Point	K-Shell Results (ppm)	K-Shell Average (ppm)	TCLP Results (mg/L)	Total Lead (ppm)
228	7+00N/7+00W	12,394	12,502		
229		12,338			
230		12,773			
231	6+00N/8+00W	18,902	19,137		
232		19,184			
233		19,325			
234	7+00N/6+00W	4,095	4,372		
235		4,329			
236		4,693			
237	6+00N/3+00W	15,836	15,993	1.82	6,390
238		16,004			
239		16,139			
240	6+00N/2+00W	24,428	24,402		
241		24,185			
242		24,595			
243	IBG-01	1,719	1,720	NA	602
244		1,860			
245		1,580			
246	IBG-02	653	636	NA	222
247		615			
248		639			
249	7+00N/5+00W	34,236	34,102		
250		33,816			
251		34,255			

TABLE 1
SOIL SAMPLE RESULTS SUMMARY
IMP BOATS SITE
CERCLIS I.D. KSD091356857

Assay #	Sample Point	K-Shell Results (ppm)	K-Shell Average (ppm)	TCLP Results (mg/L)	Total Lead (ppm)
252	7+00N/4+00W	33,429	34,277		
253		34,417			
254		34,986			
255	6+00N/5+00W	6,527	6,441		
256		6,261			
257		6,535			
258	7+00N/1+40W	40,538	40,453		
259		40,361			
260		40,459			
261	7+00N/3+00W	18,221	18,350		
262		18,479			
263		18,352			
264	6+00N/4+00W	4,800	4,651		
265		4,343			
266		4,811			
267	Post-Calibration	3,477	3,595		
268		3,442			
269		3,865			

NA - Not analyzed

SCITEC MAP 4
XRF RESULTS
CERCLIS I.D. KSD091356857
IMP Boats Site

Reference 42

1

Assay #	Sample Point	K-Shell Results PPM	L-Shell Results	Bulk Sample #	Time	General Notes
1	Calibration	4,069			1:48	
2		3,723			1:49	
3	3,755	~~#~~ 3,429			1:51	
4		3,832			1:53	
5		3,721			1:54	
6	14+85N/7+25W	23,934		14+85N/7+25W	1:58	
7	24,259	24,252			1:59	
8		24,590			2:01	
9	14+85N/5+70W	5,472		14+85N/5+70W	2:03	
10	5,359	5,286			2:05	
11		5,319			2:08	
12	14+85N/3+00W	7,273			2:11	
13	7,012	7,024			2:13	
14		6,740			2:14	
15	14+85N/8+25W	3,148		14+85N/8+25W	2:16	
16	3,179	3,202				

SCITEC MAP 4
XRF RESULTS
CERCLIS I.D. KSD091356857
IMP Boats Site

Reference 42

2

Assay #	Sample Point	K-Shell Results	L-Shell Results	Bulk Sample #	Time	General Notes
17		3,187				
18	14+85N/4+70W	16,393		14+85N/04+70W	2:26	
19	16,494	16,449			2:28	
20		16,459			2:29	
21	14+85N/3+80W	9,957		14+85N/3+80W	2:33	
22	9,944	9,905			2:35	
23		9,971			2:36	
24	14+85N/9+00W	3,571		14+85N/9+00W	2:50	
25	3,439	3,217			2:52	
26		3,529			2:54	
27	12+10N/9+60W	308		12+10N/9+60W	2:58	
28		485			2:59	
29	402	412			3:00	
30	13+85N/5+70W	16,279		13+85N/5+70W	3:01	
31	16,204	16,180				
32		16,153				

SCITEC MAP 4
XRF RESULTS
CERCLIS I.D. KSD091356857
IMP Boats Site

Reference 42

3

Assay #	Sample Point	K-Shell Results	L-Shell Results	Bulk Sample #	Time	General Notes
33	11+50N/7+50W	19		11+60N/7+60W	3:07	
34	65	-358			3:08	
35		404			3:10	
36	14+20N/1+10E	2,606		14+20N/1+10E	3:17	
37	2,918	2,946			3:19	
38		3,201			3:20	
39	13+10N/9+30W	-569		13+10N/9+30W	3:23	
40	0	-540			3:25	
41		-166			3:27	
42	13+85N/9+20W	258		13+85N/9+20W	3:30	
43	281	315			3:32	
44		-8			3:34	
45	13+70N/1+00W	8,206		13+70N/1+00W	3:37	
46	8,137	8,009			3:38	
47		8,197				
48	12+50N/0+65W	5,107		12+50N/0+65W		

SCITEC MAP 4
XRF RESULTS
CERCLIS I.D. KSD091356857
IMP Boats Site

Reference 42

4

Assay #	Sample Point	K-Shell Results	L-Shell Results	Bulk Sample #	Time	General Notes
49	4,959	4,844			3:41	
50		4,925			3:43	
51	Post-Calibration	3,850			3:47	
52	3,741	3,870			3:48	
53		3,503			3:49	
54	Pre-Calibration	3,907			10:22	
55		4,449				
56	3,935	3,735				
57		3,671				
58		3,914				
59	15+35N/6+50W	1,308		16+35N/6+50W	10:31	Duplicate Sample Taken
60	1,249	1,239			10:32	
61		1,199			10:34	
62	16+85N/0+80W	3,786		16+85N/0+80W	10:37	
63	3,949	4,055			10:39	
64		4,008			10:40	

SCITEC MAP 4
XRF RESULTS
CERCLIS I.D. KSD091356857
IMP Boats Site

Reference 42

5

Assay #	Sample Point	K-Shell Results	L-Shell Results	Bulk Sample #	Time	General Notes
65	15+60N/2+30W	1,752		15+60N/2+30W	10:47	Silty-Clay
66		1,742			10:48	
67	1,751	1,759			10:50	
68	17+85N/0+80W	5,522		17+85N/0+80W	10:52	Silty-Clay
69	5,671	5,707			10:54	
70		5,784			10:56	
71	17+30N/2+50W	11,123		17+30N/2+50W	10:57	Approximately! 50% Slag - 50% Soil
72	11,011	11,087			10:59	
73		10,824			11:01	
74	18+75N/0+80W	12,482		18+75N/0+80W	11:03	Duplicate Sample Taken
75	12,196	12,057			11:05	
76		12,048			11:06	
77	18+30N/3+50W	7,341		18+30N/3+50W	11:11	
78	7,102	7,075			11:12	
79		6,890			11:14	
80	11+40N/2+00W	22,931			11:16	Duplicate Sample Take

SCITEC MAP 4
XRF RESULTS
CERCLIS I.D. KSD091356857
IMP Boats Site

Reference 42

6

PPM

Assay #	Sample Point	K-Shell Results	L-Shell Results	Bulk Sample #	Time	General Notes
81	Cont'd 11+40N/2+00 W	23,161		11+40N/2+00W	11:17	
82	22,950	22,759			11:18	
83	18+90N/2+00W	22,385		18+90N/2+00 W	11:21	50% Slag - 50% Soil
84	22,[illegible]	22,205			11:23	
85		22,439			11:26	
86	Calibration	4,008			12:42	
87		3,736			12:43	
88	3,690	3,362			12:44	
89		3,661			12:45	
90		3,693			12:46	
91	18+70N/4+60W	22,824		18+70N/4+60 W	12:57	
92	22,5[illegible]	22,430			12:59	
93		22,453			13:00	
94	18+70N/6+60W	1,615		18+70N/6+60 W	13:01	
95	1,854	1,865			13:03	
96		2,084			13:05	

SCITEC MAP 4
XRF RESULTS
CERCLIS I.D. KSD091356857
IMP Boats Site

Reference 42

7

Assay #	Sample Point	K-Shell Results	L-Shell Results	Bulk Sample #	Time	General Notes
97	17+70N/4+60W	5,447		17+70N/4+60W	13:07	
98	5,311	5,134			13:09	
99		5,361			13:10	
100	18+70N/5+60W	13,932		18+70N/5+60W	13:15	
101	14,126	14,124			13:16	
102		14,321			13:18	
103	17+70N/5+60W	1,136		17+70N/5+60W	13:20	Sandy
104	1,151	1,249			13:22	
105		1,069			13:24	
106	Calibration	4,391			3:28	
107		3,546			3:29	
108	3,635	3,198			3:30	
109		3,398			3:32	
110		3,641			3:34	
111	8+00N/9+00W	698		8+00N/9+00W	3:35	
112	686	580			3:36	

Reference 42

SCITEC MAP 4
XRF RESULTS
CERCLIS I.D. KSD091356857
IMP Boats Site

(8)

Assay #	Sample Point	K-Shell Results	L-Shell Results	Bulk Sample #	Time	General Notes
113	9+00N/9+00W	786		9+00N/9+00W	3:37	
114	11+00N/3+00W	13,878		11+00/3+00W	3:40	
115		14,286			3:42	
116	13,999	13,833			3:43	
117	10+00N/3+00W	21,867		10+00N/3+00W	3:46	
118	21,801	21,778			3:48	
119		21,757			3:49	
120	10+00N/9+00W	11,882		10+00N/9+00W	4:15	
121		12,457			4:16	
122	12,161	12,161			4:18	
123	10+00N/6+00W	51,889		10+00N/6+00W	4:22	
124	51,996	52,041				
125		52,059				
126	10+00N/8+00W	9,031		10+00N/8+00W	6:55	
127	9,196	9,267			6:57	
128		9,291				

Reference 42

SCITEC MAP 4
XRF RESULTS
CERCLIS I.D. KSD091356857
IMP Boats Site

9

Assay #	Sample Point	K-Shell Results	L-Shell Results	Bulk Sample #	Time	General Notes
129	11+00N/8+00W	608		11+00N/8+00W	7:00	
130	2,290	992			7:02	
131	[redacted]	677			7:03	
132	10+00N/9+00W	12,998		10+00N/4+00W	7:12	
133	13,456	13,391			7:13	
134		13,975			7:14	
135	6+00N/9+00W	9,537		6+00N/9+00W	7:20	
136	9,377	9,463			7:22	
137		9,135			7:24	
138	10+00N/5+00W	24,141		10+00N/6+00W	7:26	
139	24,092	24,444			7:28	
140		23,690			7:30	
141	7+00N/9+00W	43		7+00N/9+00W		
142	205	270				
143		-108				
144	10+00N/7+00W	12,777		5+00N/7+00W		

SCITEC MAP 4
XRF RESULTS
CERCLIS I.D. KSD091356857
IMP Boats Site

Reference 42

10

Assay #	Sample Point	K-Shell Results	L-Shell Results	Bulk Sample #	Time	General Notes
145	10+00N/7+00W	12,858		10+00N/7+00W	8:03	
146	12,487	11,827			8:05	
147	11+00N/4+00W	36,629		11+00N/4+00W		
148	36,502	36,685				
149		36,191				
150	9+00N/9+00W	-294		9+00N/9+00W		
151	0	-216				
152		-325				
153	8+50N/0+50W	5490		8+50N/0+50W	8:40	
154	5,940	5738			8:44	
155		6591			8:46	
156	11+00N/5+00W	15,804		11+00N/5+00 W		
157	15,584	15,531				
158		15,417				
159	Post-Calibration	3861				
160		3,746				

XRF RESULTS

CERCLIS I.D. ~~KSD981708654~~

~~Goberly Recycling Site~~ IMP Boats

Reference 42

(11)

PPM

Assay #	Sample Point	K-Shell Results	L-Shell Results	Bulk Sample #	Time	General Notes
161	Post-Calibrations	3,741 3,783				
162	Pre-Calibration	3,865			10:49	
163		4,296			10:50	
164	3,857	3,117			10:51	
165		4,097			10:52	
166		3,909			10:53	
167	9+00N/5+00W	44,396		N+00N/5+00W	11:02	
168	44,422	44,379			11:04	
169		44,490			11:06	
170	9+00N/3+00W	6,299		9+00N/3+00W	11:09	
171	5,954	5,895			11:10	
172		5,669			11:12	
173	8+00N/5+00W	54,605		8+00N/5+00W	11:13	
174	54,593	54,502			11:15	
175		54,672			11:16	
176	8+00N/3+00W	16,274		8+00N/3+00W		

SCITEC MAP 4
XRF RESULTS
CERCLIS I.D. ~~KSD981708654~~
~~Coberly Recycling Site~~ IMP Boats

Reference 42

(12)

Assay #	Sample Point	K-Shell Results	L-Shell Results	Bulk Sample #	Time	General Notes
177	8+00N/3+00W	16,355		8+00N/3+00W	11:21	
178	16,250	16,121			11:23	
179	9+60N/0+50W	2,333		09+50N/0+60W	11:36	
180	1,910	1,684			11:39	
181		1,714			11:40	
182	8+00N/4+00W	12,644		8+00N/4+00W	11:42	
183	12,566	12,515			11:43	
184		12,535			11:46	
185	9+00N/6+00W	47,539		9+00N/6+00W	11:46	
186	47,552	47,516			11:48	
187		47,602			11:49	
188	9+00N/7+00W	36,586		9+00N/7+00W	11:55	
189	36,921	37,020			11:56	
190		36,858			11:58	
191	9+00N/4+00W	37,761		9+00N/4+00W	12:05	
192	37,916	37,773				

XRF RESULTS

CERCLIS I.D. ~~KSD981708654~~

~~Cuberly Recycling Site~~ IMP Boats

Reference 42

13

ppm

Assay #	Sample Point	K-Shell Results	L-Shell Results	Bulk Sample #	Time	General Notes
193	9+00N/4+00W	37,915		9+00N/4+00W	12:10	
194	8+00N/6+00W	53,444		8+00N/6+00W	12:11	50% Slag, 50% Soil
195	53,481	53,542			12:13	
196		53458			12:15	
197	8+00N/7+00W	33,158		8+00N/7+00W	12:21	
198	33,187	33,242			12:23	
199		33,161			12:25	
200	9+50N/1+50W	1,175		9+50N/1+50W	12:30	
201	907	736			12:31	
202		809			12:32	
203	8+00N/8+00W	24,368		8+00N/8+00W		
204	24,472	24,566				
205		24,482				
206	8+50N/1+50W	13,467		8+50N/1+50W	12:42	
207	13,631	13,935			12:44	
209		13,492			12:47	

XRF RESULTS
CERCLIS I.D. ~~KSD981708654~~
~~Coberly Recycling Site~~

IMP Boats

Reference ~~42~~ 14

Assay #	Sample Point	K-Shell Results	L-Shell Results	Bulk Sample #	Time	General Notes
210	Post-Calibrate	3,225				
211	3,662	3,808				
212		3,954				
213	Pre-Calibration	4,386				
214		3,842				
215	4,136	4,053				
216		4,388				
217		3,411				
218		3,579				
219	6+00N/7+00W	6,412		6+00N/7+00W	1:33	
220	6,372	6,218			1:35	
221		6,486			1:37	
222	6+00N/6+00W	2,610		6+00N/6+00W	1:39	
223	2,571	2,567			1:41	
224		2,537			1:43	
225	7+00N/8+00W	18,247		7+00N/8+00W	1:44	

XRF RESULTS
CERCLIS I.D. ~~KSD981708654~~
~~Coberly Recycling~~ Site

IMP Boats

Reference 42

15

Assay #	Sample Point	K-Shell Results	L-Shell Results	Bulk Sample #	Time	General Notes
226	7+00N/8+00W	17,932		7+00N/8+00W	1:47	
227	18,916	18,408			1:49	
228	7+00N+7+00W	12,394		7+00N+7+00W	1:53	
229	12,502	12,338			1:55	
230		12,773			1:57	
231	6+00N/8+00W	18,902		6+00N/8+00W	1:59	
232	19,137	19,184			2:01	
233		19,325			2:03	
234	7+00N/6+00W	4,095		7+00N/6+00W	2:05	
235	4,372	4,329			2:08	
236		4,693			2:10	
237	6+00N/3+00W	15,836		6+00N/3+00W	2:14	
238	15,993	16,004			2:16	
239		16,139			2:18	
240	6+00N/2+00W	24,428		6+00N/2+00W	2:20	
241	24,407	24,185			2:22	

24,595

XRF RESULTS
CERCLIS I.D. ~~KS0000102129~~
~~East Iola Site Field Log~~

Reference 42

IMP Boats

	Assay #	Sample Point	K-Shell Results	L-Shell Results	Bulk Sample #	Time	General Notes
	242	6+00N/2+00W	24,595		6+00N/2+00W	2:24	
	243	IBG-01	1,719		IBG-01	2:28	
	244	1,720	1,860			2:30	
	245		1,580			2:32	
	246	IBG-02	653		IBG-02	2:34	
	247	636	615			2:38	
	248		639			2:40	
	249	7+00N/5+00W	34,236		7+00N/5+00W	2:44	
	250		33,816			2:46	
	251	34,102	34,255			2:47	
	252	7+00N/4+00W	33,429		7+00N/4+00W	2:49	50% Slag, 50% Soil
	252	34,277	34,417			2:51	
1	253		34,986			2:53	
5	254	6+00N/5+00W	6,527		6+00N/5+00W	3:02	
6	255	6,441	6,261			3:04	
7	256		6,535				

XRF RESULTS
CERCLIS I.D. ~~KSD981708654~~
~~Coberly Recycling Site~~ IMP Boats

	Assay #	Sample Point	K-Shell Results	L-Shell Results	Bulk Sample #	Time	General Notes
8	257	7+00N/1+40W	40,538		7+00N/1+40W	3:07	
9	258	40,453	40,361			3:09	
0	259		40,459			3:11	
1	260	7+00N/3+00W	18,221		7+00N/3+00W	3:12	
2	261	18,350	18,479			3:13	
3	262		18,352			3:15	
4	263	6+00N/4+00W	4,800		6+00N/4+00W	3:49	
5	264		4,343			3:51	
6	265	4,651	4,811			3:52	
	~~266~~	~~ESS-2-2.5~~	~~285~~		~~ESS-2-2.5~~	~~3:54~~	~~Tan, Silty-Clay, Plastic, Fat~~
	267		~~-25~~			3:56	
	~~268~~		383			3:57	
7	269	Post-Calibration	3,477		—	3:58	
8	270	3,595	3,442			3:59	
9	271		3,865			4:00	
	272						

AML
Ecol Management Laboratories, Inc.

15130 South Keeler, Olathe, Kansas 66062
Phone: (913) 829-0101 • Fax: (913) 829-1181
e-mail: amlab@idir.net

Certificate of Analysis

May 26, 1998

Mr. Dan Evans
Kingston Environmental
1600 S.W. Market
Lee's Summit, MO 64081
Phone: 524-8811
Fax: 525-5027

Client Project ID: IMP / 97R850
Chain of Custody #: 3466, 3467

Lab Project Number: 051898.03

Dear Mr. Evans:

Included are the analytical results for the water samples received on May 15, 1998. All analyses were prepared and analyzed within method required holding times.

If you have any questions regarding this report, feel free to contact me at (913) 829-0101.

Kendall Lindquist
Laboratory Manager

Le

AmL
ical Management Laboratories, Inc.
15130 South Keeler, Olathe, Kansas 66062
Phone: (913) 829-0101 • Fax: (913) 829-1181
e-mail: amlab@idir.net

Certificate of Analysis

Mr. Dan Evans
Kingston Environmental

Client Project ID: IMP / 97R850
Chain of Custody #: 3466

Lab Project Number: 051898.03

Client Sample ID: 17+30N 2+50W — Date Collected: 05/15/98
Lab Sample ID: A1126 — Date Received 05/15/98

Analyte	Results	Units	Detection Limit	Action Level	Analyst	Date Analyzed	Method
TCLP-Lead	1.61	mg/L	0.050	5.0	KEZ	05/22/98	6010
Total Lead	4880	mg/kg	100		KEZ	05/22/98	6010

Client Sample ID: 18+70N 5+60W — Date Collected: 05/15/98
Lab Sample ID: A1127 — Date Received 05/15/98

Analyte	Results	Units	Detection Limit	Action Level	Analyst	Date Analyzed	Method
TCLP-Lead	3.23	mg/L	0.050	5.0	KEZ	05/22/98	6010
Total Lead	6840	mg/kg	100		KEZ	05/22/98	6010

Client Sample ID: 11+00N 3+00W — Date Collected: 05/15/98
Lab Sample ID: A1128 — Date Received 05/15/98

Analyte	Results	Units	Detection Limit	Action Level	Analyst	Date Analyzed	Method
TCLP-Lead	7.58	mg/L	0.050	5.0	KEZ	05/22/98	6010
Total Lead	8010	mg/kg	100		KEZ	05/22/98	6010

Client Sample ID: 10+00N 9+00W — Date Collected: 05/15/98
Lab Sample ID: A1129 — Date Received 05/15/98

Analyte	Results	Units	Detection Limit	Action Level	Analyst	Date Analyzed	Method
TCLP-Lead	6.80	mg/L	0.050	5.0	KEZ	05/22/98	6010
Total Lead	6060	mg/kg	100		KEZ	05/22/98	6010

Client Sample ID: 14+85N 8+25W — Date Collected: 05/15/98
Lab Sample ID: A1130 — Date Received 05/15/98

Analyte	Results	Units	Detection Limit	Action Level	Analyst	Date Analyzed	Method
TCLP-Lead	0.381	mg/L	0.050	5.0	KEZ	05/22/98	6010
Total Lead	1010	mg/kg	100		KEZ	05/22/98	6010

\|ℓ

15130 South Keeler, Olathe, Kansas 66062
Phone: (913) 829-0101 • Fax: (913) 829-1181
e-mail: amlab@idir.net

AML
Analytical Management Laboratories Inc.

Kingston Environmental

Certificate of Analysis

Client Project ID: IMP / 97R850

Chain of Custody #: 3466

Lab Project Number: 051598.02

Client Sample ID: 14+20N 1.10W — Date Collected: 05/15/98

Lab Sample ID: A1131 — Date Received 05/15/98

Analyte	Results	Units	Detection Limit	Action Level	Analyst	Date Analyzed	Method
TCLP-Lead	0.572	mg/L	0.050	5.0	KEZ	05/22/98	6010
Total Lead	792	mg/kg	100		KEZ	05/22/98	6010

Client Sample ID: 12+50N 0+65W — Date Collected: 05/15/98

Lab Sample ID: A1132 — Date Received 05/15/98

Analyte	Results	Units	Detection Limit	Action Level	Analyst	Date Analyzed	Method
TCLP-Lead	1.63	mg/L	0.050	5.0	KEZ	05/22/98	6010
Total Lead	1070	mg/kg	100		KEZ	05/22/98	6010

Client Sample ID: 14+85N 9+00W — Date Collected: 05/15/98

Lab Sample ID: A1133 — Date Received 05/15/98

Analyte	Results	Units	Detection Limit	Action Level	Analyst	Date Analyzed	Method
TCLP-Lead	0.361	mg/L	0.050	5.0	KEZ	05/22/98	6010
Total Lead	1800	mg/kg	100		KEZ	05/22/98	6010

Client Sample ID: 18+30N 3+50W — Date Collected: 05/15/98

Lab Sample ID: A1134 — Date Received 05/15/98

Analyte	Results	Units	Detection Limit	Action Level	Analyst	Date Analyzed	Method
TCLP-Lead	0.986	mg/L	0.050	5.0	KEZ	05/22/98	6010
Total Lead	3540	mg/kg	100		KEZ	05/22/98	6010

Client Sample ID: 9+00N 3+00W — Date Collected: 05/15/98

Lab Sample ID: A1135 — Date Received 05/15/98

Analyte	Results	Units	Detection Limit	Action Level	Analyst	Date Analyzed	Method
TCLP-Lead	3.90	mg/L	0.050	5.0	KEZ	05/22/98	6010
Total Lead	1090	mg/kg	100		KEZ	05/22/98	6010

15130 South Keeler, Olathe, Kansas 66062
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e-mail: amlab@idir.net

AmL
...ical Management Laboratories, Inc.

Certificate of Analysis

Kingston Environmental

Client Project ID: IMP / 97R850
Chain of Custody #: 3467

Lab Project Number: 051898.03

Client Sample ID:	11+00N 5+00W		Date Collected:			05/15/98	
Lab Sample ID:	A1136		Date Received			05/15/98	
Analyte	**Results**	**Units**	**Detection Limit**	**Action Level**	**Analyst**	**Date Analyzed**	**Method**
Total Lead	4.11	mg/L	0.050	5.0	KEZ	05/22/98	6010
Total Lead	6330	mg/kg	100		KEZ	05/22/98	6010

Client Sample ID:	6+00N 3+00W		Date Collected:			05/15/98	
Lab Sample ID:	A1137		Date Received			05/15/98	
Analyte	**Results**	**Units**	**Detection Limit**	**Action Level**	**Analyst**	**Date Analyzed**	**Method**
TCLP-Lead	1.82	mg/L	0.050	5.0	KEZ	05/22/98	6010
Total Lead	6390	mg/kg	100		KEZ	05/22/98	6010

Ke

Phone (913)829-0101 * Fax (913) 829-1181

Chain of Custody Record

Reference 42

Client Contact Name: Dan Evans
Company Name: Kingston Environmental
Address: 1600 S.W. Market
City, State, Zip: Lee's Summit, MO 64081
Phone #: ( ) 524-8811
Fax #: ( ) 525-5027

Project Name: IMP &
Project Number: 97R850
Project Due Date: 5-22-98
Project Comments:
Sampler's Signature: Dan T. Ev

Analyses/Methods to be Performed (Check all that apply)

Laboratory Project Number: 051898.03

Method # -->

This is the identifier that will appear on the report. The field ID is most commonly used.

List Date and Time each sample taken.

s=soil w=water a=air o=oil

Preservative: List total number of bottles for each preservative type.

Please include any information that may be useful in the analysis of the sample. Example: high concentration

Lab ID	Sample Description	Date	Time	Matrix	Total # Containers	HCL	HNO_3	NaOH	Unpreserved	4 ° C	TPH Diesel	TPH Gas	BTEX	BTEX/MTBE/OA1	Volatiles (VOCs)	BNAs (SVOCs)	Pesticides/PCBs	PCBs	TCLP ~~Metals~~ lead	RCRA8 Metals	Lead total	Flash Point	Paint Filter Test	Comments
A1126	17+30N 2+50W			S															X		X			
A1127	18+70N 5+40W																		X		X			
A1128	11+00N 3+00W																		X		X			
A1129	10+00N 9+00W																		X		X			
A1130	14+85N 8+25W																		X		X			
A1131	14+80N 1+10W																		X		X			
A1132	12+50N 0+65W																		X		X			
A1133	14+85N 4+00W																		X		X			
A1134	18+30N 3+50W																		X		X			
A1135	9+00N 7+00W																		X		X			

CUSTODY

Relinquished By:	Dan T. Ev	Date/Time:	5-15 / 5:00	Received By:	Date/Time:
Relinquished By:		Date/Time:		Received By:	Date/Time:

Delivery Method	Custody Seals	Coolant	Cooler Temp	Receiving Comments
☒ Delivered In Person	☐ Yes ☒ No	☐ Ice		
☐ Courier ____	☐ Intact	☐ Blue Ice	☐ Temp Blank	
☐ Airbill #: ____	☐ Broken	☒ None	☐ Cooler	

15130 B South Keeler - Olathe, KS 66062
Phone (913)829-0101 * Fax (913) 829-1181

Reference 42

Chain of Custody Record

Client Contact Name:	Dan Evans	Project Name:	TMP
Company Name:	Kingston Environmental	Project Number:	97R 950
Address:	1600 S.W. Market	Project Due Date:	5-22-98
City, State, Zip:	Lee's Summit, MO 64081	Project Comments:	
Phone #:	( ) 524-8811		
Fax #:	( ) 525-5027	Sampler's Signature:	[signature]

Laboratory Project Number: 05/598.03

Analyses/Methods to be Performed (Check all that apply)

Method # -->

Lab ID: This is the identifier that will appear on the report. The field ID is most commonly used.

Date / Time: List Date and Time each sample taken.

Matrix: s=soil w=water a=air o=oil

Preservative: List total number of bottles for each preservative type.

Comments: Please include any information that may be useful in the analysis of the sample. Example: high concentration

Lab ID	Sample Description	Date	Time	Matrix	Total # Containers	HCL	HNO_3	NaOH	Unpreserved	4 °C		TPH Diesel	TPH Gas	BTEX	BTEX/MTBE/OA1	Volatiles (VOCs)	BNAs (SVOCs)	Pesticides/PCBs	PCBs	TCLP ~~Metals~~ /2008	RCRA8 Metals	Lead Total	Flash Point	Paint Filter Test					Comments
A1136	11700N 5700W			S																X		X							
A1137	6700N 3700W																			X		X							
A1138	17270N 4460W																												HOLD
A1139	11740N 72700W																												
A1140	19775N 0720W																												
A1141	19770N 6460W																												
A1142	17495N 0720																												
A1143	15460N 2730W																												
A1144	10700N 8700W																												
A1145	10400N 5700W																												

CUSTODY

Relinquished By:	[signature]	Date/Time:	5/15 5:00	Received By:		Date/Time:
Relinquished By:		Date/Time:		Received By:		Date/Time:

Delivery Method	Custody Seals	Coolant	Cooler Temp.	Receiving Comments
☐ Delivered in Person ☐ Courier ______ ☐ Airbill #: ______	☐ Yes ☐ No ☐ Intact ☐ Broken	☐ Ice ☐ Blue Ice ☐ None	☐ Temp. Blank ☐ Cooler	

AmL
l Management Laboratories, Inc.

15130 So... Kansas 66062
Phone: (913) 829-0101 • Fax: (913) 829-1181
e-mail: amlab@idir.net

Certificate of Analysis

May 26, 1998

Mr. Dan Evans
Kingston Environmental
1600 S.W. Market
Lee's Summit, MO 64081
Phone: 524-8811
Fax: 525-5027

Client Project ID: IMP / 97R850
Chain of Custody #: 3465, 3452

Lab Project Number: 051598.02

Dear Mr. Evans:

Included are the analytical results for the water samples received on May 14, 1998. All analyses were prepared and analyzed within method required holding times.

If you have any questions regarding this report, feel free to contact me at (913) 829-0101.

Kendall Lindquist
Laboratory Manager

Ve

AML
Analytical Management Laboratories, Inc.
15130 South Keeler, Olathe, Kansas 66062
Phone: (913) 829-0101 • Fax: (913) 829-1181
e-mail: amlab@idir.net

Certificate of Analysis

Mr. Dan Evans
Kingston Environmental

Client Project ID: IMP / 97R850 | Lab Project Number: 051598.02
Chain of Custody #: 3465, 3452

Client Sample ID: 8+00N 6+00W | Date Collected: 05/13/98
Lab Sample ID: A1088 | Date Received 05/14/98

Analyte	Results	Units	Detection Limit	Action Level	Analyst	Date Analyzed	Method
TCLP-Lead	218	mg/L	0.050	5.0	KEZ	05/19/98	6010
Total Lead	19000	mg/kg	100		KEZ	05/22/98	6010

Client Sample ID: 9+00N 6+00W | Date Collected: 05/13/98
Lab Sample ID: A1089 | Date Received 05/14/98

Analyte	Results	Units	Detection Limit	Action Level	Analyst	Date Analyzed	Method
TCLP-Lead	62.9	mg/L	0.050	5.0	KEZ	05/19/98	6010
Total Lead	24600	mg/kg	100		KEZ	05/22/98	6010

Client Sample ID: 8+00N 5+00W | Date Collected: 05/13/98
Lab Sample ID: A1090 | Date Received 05/14/98

Analyte	Results	Units	Detection Limit	Action Level	Analyst	Date Analyzed	Method
TCLP-Lead	199	mg/L	0.050	5.0	KEZ	05/19/98	6010
Total Lead	22500	mg/kg	100		KEZ	05/22/98	6010

Client Sample ID: 10+00N 6+00W | Date Collected: 05/13/98
Lab Sample ID: A1091 | Date Received 05/14/98

Analyte	Results	Units	Detection Limit	Action Level	Analyst	Date Analyzed	Method
TCLP-Lead	123	mg/L	0.050	5.0	KEZ	05/19/98	6010
Total Lead	13000	mg/kg	100		KEZ	05/22/98	6010

Client Sample ID: 15+35N 6+50W | Date Collected: 05/13/98
Lab Sample ID: A1092 | Date Received 05/14/98

Analyte	Results	Units	Detection Limit	Action Level	Analyst	Date Analyzed	Method
TCLP-Lead	0.474	mg/L	0.050	5.0	KEZ	05/19/98	6010
Total Lead	344	mg/kg	100		KEZ	05/22/98	6010

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15130 South Keeler, Olathe, Kansas 66062
Phone: (913) 829-0101 • Fax: (913) 829-1181
e-mail: amlab@aidir.net

Certificate of Analysis

Kingston Environmental

Client Project ID: IMP / 97R850
Chain of Custody #: 3465
Lab Project Number: 051598.02

Client Sample ID: 17+70N 5+60W — Date Collected: 05/13/98
Lab Sample ID: A1093 — Date Received 05/14/98

Analyte	Results	Units	Detection Limit	Action Level	Analyst	Date Analyzed	Method
TCLP-Lead	0.103	mg/L	0.050	5.0	KEZ	05/19/98	6010
Total Lead	156	mg/kg	100		KEZ	05/22/98	6010

Client Sample ID: 11+00N 8+00W — Date Collected: 05/13/98
Lab Sample ID: A1094 — Date Received 05/14/98

Analyte	Results	Units	Detection Limit	Action Level	Analyst	Date Analyzed	Method
TCLP-Lead	0.065	mg/L	0.050	5.0	KEZ	05/19/98	6010
Total Lead	320	mg/kg	100		KEZ	05/22/98	6010

Client Sample ID: 9+50N 1+50W — Date Collected: 05/13/98
Lab Sample ID: A1095 — Date Received 05/14/98

Analyte	Results	Units	Detection Limit	Action Level	Analyst	Date Analyzed	Method
TCLP-Lead	0.179	mg/L	0.050	5.0	KEZ	05/19/98	6010
Total Lead	332	mg/kg	100		KEZ	05/22/98	6010

Client Sample ID: IBG-1 — Date Collected: 05/13/98
Lab Sample ID: A1096 — Date Received 05/14/98

Analyte	Results	Units	Detection Limit	Action Level	Analyst	Date Analyzed	Method
Total Lead	602	mg/kg	100		KEZ	05/22/98	6010

Client Sample ID: IBG-2 — Date Collected: 05/13/98
Lab Sample ID: A1097 — Date Received 05/14/98

Analyte	Results	Units	Detection Limit	Action Level	Analyst	Date Analyzed	Method
Total Lead	222	mg/kg	100		KEZ	05/22/98	6010

Phone (913)829-0101 * Fax (913) 829-1181

Chain of Custody Record

Reference 42

Client Contact Name: Dan Evans
Company Name: Kingston Environmental
Address: 1600 S.W. Market
City, State, Zip: Lee's Summit, MO 64081
Phone #: ( ) 524-8811
Fax #: ( ) 525-5027

Project Name: IMP
Project Number: 97R850
Project Due Date:
Project Comments:
Sampler's Signature: [signature]

Laboratory Project Number: 051598.02

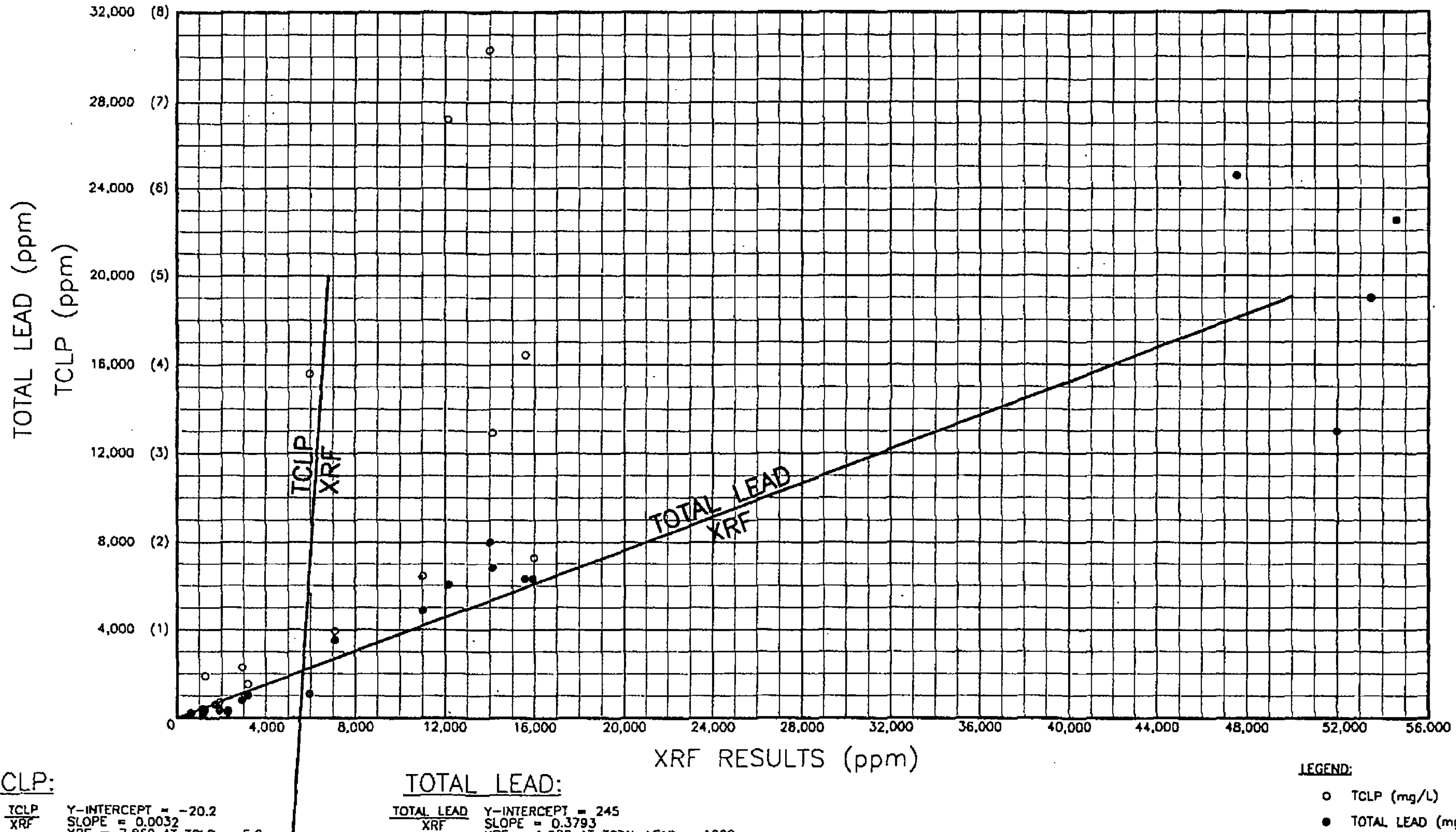
Analyses/Methods to be Performed (Check all that apply)

Method # -->

Lab ID	Sample Description (This is the identifier that will appear on the report. The field ID is most commonly used.)	Date (List Date and Time each sample taken.)	Time	Matrix (s=soil w=water a=air o=oil)	Total # Containers	Preservative: HCL	HNO_3	NaOH	Unpreserved	4 °C	TPH Diesel	TPH Gas	BTEX	BTEX/MTBE/OA1	Volatiles (VOCs)	BNAs (SVOCs)	Pesticides/PCBs	PCBs	TCLP ~~Metals~~ Lead	RCRA8 Metals	Lead Total	Flash Point	Paint Filter Test	Please include any information that may be useful in the analysis of the sample. Example: high concentration
A1088	8700N 6700W	5-13	1:00	S	1														X		X			
A1089	9700N 6700W		1:05		1														X		X			
A1090	8700N 5700W		1:10		1														X		X			
A1091	10700N 6700W		1:15		1														X		X			
A1092	15735N 6750W		2:00		1														X		X			
A1093	17480N 5760W		2:10		1														X		X			
A1094	11700N 8700W		2:15		1														X		X			
A1095	9735N 1275W		2:20		1														X		X			
A1096	IBG 1		3:00		1																X			
A1097	IBG 2		3:15																		X			

CUSTODY				
Relinquished By: [signature]	Date/Time: 5-14-98 520	Received By: [signature]	Date/Time: 5/14/98 500
Relinquished By:	Date/Time:	Received By:	Date/Time:

Delivery Method	Custody Seals	Coolant	Cooler Temp:	Receiving Comments
☐ Delivered in Person ☐ Courier ______ ☐ Airbill #: ______	☐ Yes ☐ No ☐ Intact ☐ Broken	☐ Ice ☐ Blue Ice ☐ None	☐ Temp Blank ☐ Cooler	



TCLP:

TCLP / XRF
Y-INTERCEPT = −20.2
SLOPE = 0.0032
XRF = 7,860 AT TCLP = 5.0
r = 90

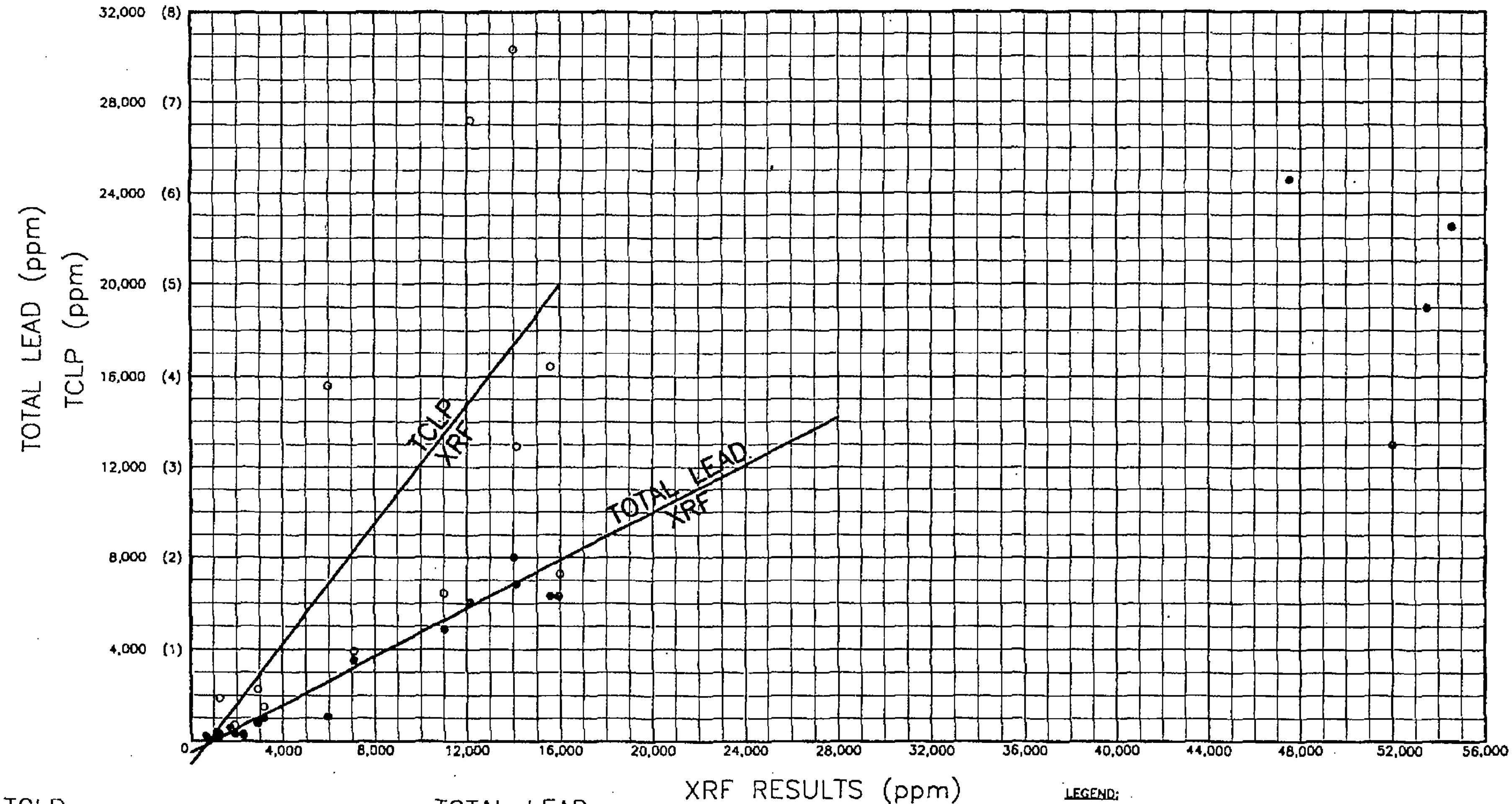
TOTAL LEAD:

TOTAL LEAD / XRF
Y-INTERCEPT = 245
SLOPE = 0.3793
XRF = 1,988 AT TOTAL LEAD = 1000
r = 0.95

	DRAWN BY: J.N.C.
DATE: 6-4-98	APPENDIX
DWG. #: 1112-5	
PROJ. #: 97R850	

LEAST SQUARES LINEAR REGRESSION PLOT (20 POINT)
IMP BOATS, INC.
IOLA, KS

Kingston Environmental Services
1600 S.W. Market
Lee's Summit, Mo. 64081 (816) 524-8811



TCLP:

TCLP / XRF
Y-INTERCEPT = -0.1405
SLOPE = 0.003
XRF = 16,690 AT TCLP = 5.0
r = 0.72

TOTAL LEAD:

TOTAL LEAD / XRF
Y-INTERCEPT = -590
SLOPE = 0.4982
XRF = 3,190 AT TOTAL LEAD = 1000
r = 0.97

LEGEND:

○ TCLP (mg/L)

● TOTAL LEAD (mg/kg)

	DRAWN BY : J.N.C.
DATE : 6-4-98	APPENDIX
DWG. # : 1112-5	
PROJ. # : 97R850	

LEAST SQUARES LINEAR REGRESSION PLOT (16 POINT)
IMP BOATS, INC.
IOLA, KS

Kingston Environmental Services
1600 S.W. Market
Lee's Summit, Mo. 64081 (816) 524-8811

IMP BOATS, INC.

SITE ASSESSMENT

BY

E & E

ecology and environment, inc.
CLOVERLEAF BUILDING 3, 6405 METCALF, OVERLAND PARK, KANSAS 66202, TEL. 913/432-9961
International Specialists in the Environment

MEMORANDUM

TO: Roy Crossland, EPA/DPO

FROM: Lynn Parman, E & E/TATM JCC for

THRU: Joe Chandler, E & E/TATL JCC

DATE: October 11, 1993

SUBJECT: Site Assessment: IMP Boats, Inc.
Iola, Kansas
TDD: T07-9306-002
PAN: EKS0382SAA
SSID: KY
EPA/OSC: Jamie Bernard-Drakey

INTRODUCTION

The Ecology and Environment, Inc., Technical Assistance Team (TAT) was tasked by the U.S. Environmental Protection Agency (EPA) Emergency Planning and Response (EP&R) Branch to collect soil samples at the IMP Boats, Inc., site in Iola, Kansas (see Attachment A), to be used in the development of a site-specific calibration model for lead for a field-portable X-ray fluorescence (XRF) spectrometer. After development of this model, the XRF could then be used to field screen site soils, to provide the data quality objectives of level QA2, as defined in the Quality Assurance/Quality Control Guidance for Removal Activities (EPA/540/G-90/004). Lynn Parman was assigned as the TAT project manager.

SITE ACTIVITIES

On June 9, 1993, Parman was accompanied by EPA On-Scene Coordinator Jamie Bernard-Drakey and an EPA summer intern to conduct sample collection at the site. An Outokumpu X-MET 880 XRF was used in conjunction with a previously developed calibration model (for the 7th Street Lead site in Des Moines, Iowa) to screen the site to determine the range of relative lead concentrations throughout the area of concern. Twelve surface soil samples (RRXKY001-012) were collected from various areas of the site, along with an off-site background sample (RRXKY013) collected from a nearby park. A duplicate (split) sample (RRXKY006D) was also collected from the site. Sample locations are depicted on a site sketch included as Attachment B (modified from map originally prepared by Jacobs Engineering Group, Inc.).

DISCUSSION OF SAMPLE RESULTS

The soil samples were submitted to the Region VII EPA Laboratory on June 10, 1993, for analysis of total metals. Bernard-Drakey subsequently provided TAT the analytical results (Attachment C), which indicated that other metals (besides lead) were detected at elevated levels. A brief summary of lab results for these metals and associated concentrations of concern follows:

METAL	HIGHEST CONCENTRATION DETECTED/SAMPLE #	BACKGROUND (RRXKY013)	ACTION LEVEL PROPOSED OR ENFORCED AT OTHER EPA REGION 7 SITES
Arsenic	85.7 mg/kg / RRXKY003	<10.0 mg/kg	19 mg/kg[1]
Cadmium	427 mg/kg / RRXKY003	2.71 mg/kg	24 mg/kg[2]
Lead	9,340 mg/kg / RRXKY004	88.5 mg/kg	500/1,000 mg/kg[3]
Zinc	69,500 mg/kg / RRXKY004	363 mg/kg	10,000 mg/kg[4]

1 = R & O Processors site, Granby, Missouri
2 = R & O Processors site, Granby, Missouri
3 = Reliance Battery site, Council Bluffs, Iowa
4 = Cherokee County site, Cherokee County, Kansas

Reproducibility of concentrations in the duplicate compared to the original sample is expressed as a relative percent difference (RPD) for the metals of concern, as follows:

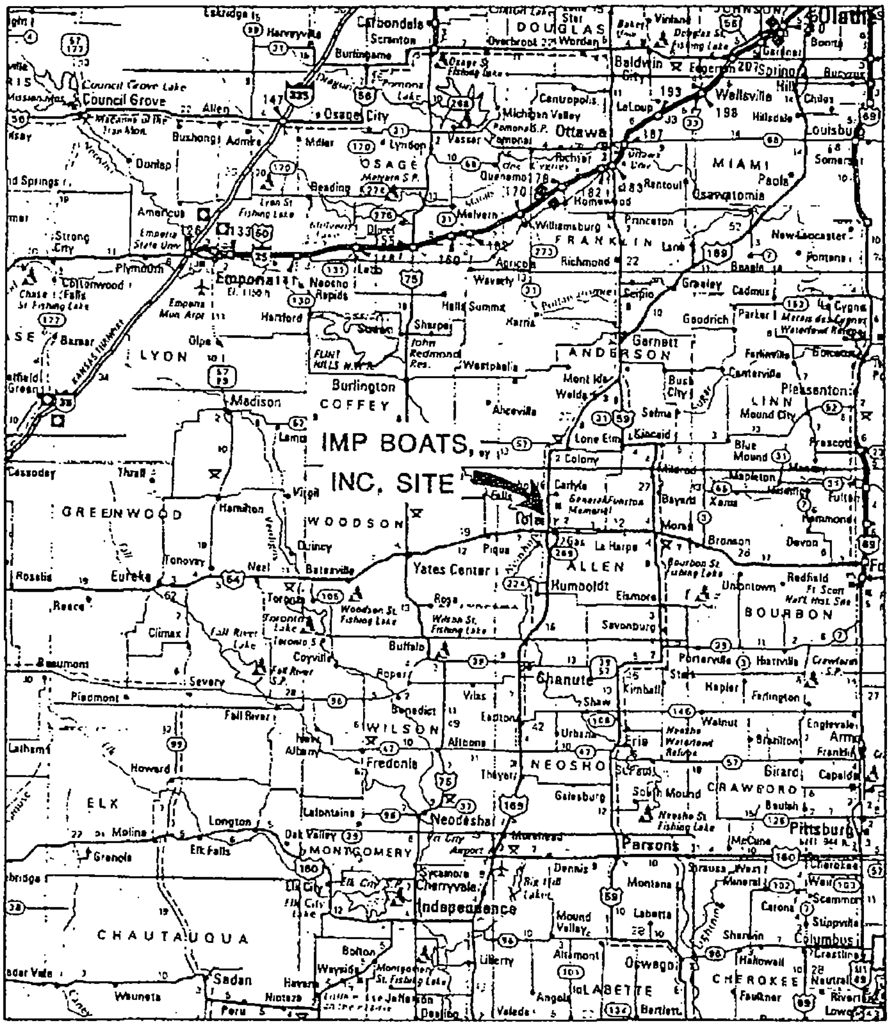
METAL	ORIGINAL (mg/kg)	DUPLICATE (mg/kg)	RPD
Arsenic	15.8	19.4	20.5
Cadmium	51.3	58.6	13.3
Lead	4,690	3,250	36.3
Zinc	25,100	25,700	2.4

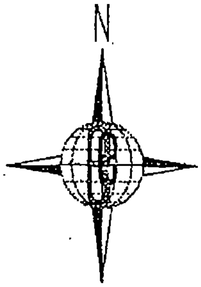
For the set of 13 samples that was collected, arsenic, cadmium, and zinc values were all below previous Region 7 EPA action levels (listed earlier in this report) in samples that contained less than 1,000 mg/kg lead (the anticipated removal action level for the IMP Boats, Inc., site). Because of this relationship, lead will be used as the primary indicator during subsequent XRF screening to determine the overall extent of metals contamination in site soils. The laboratory data acquired from these samples will be used to develop a site-specific calibration model when an XRF unit becomes available and site assessment scheduling becomes finalized by EPA (tentatively proposed for late 1993).

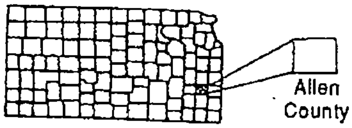
ATTACHMENTS

A: Site Location Map
B: Site Sketch with Sample Locations
C: Analysis Request Report

ATTACHMENT A







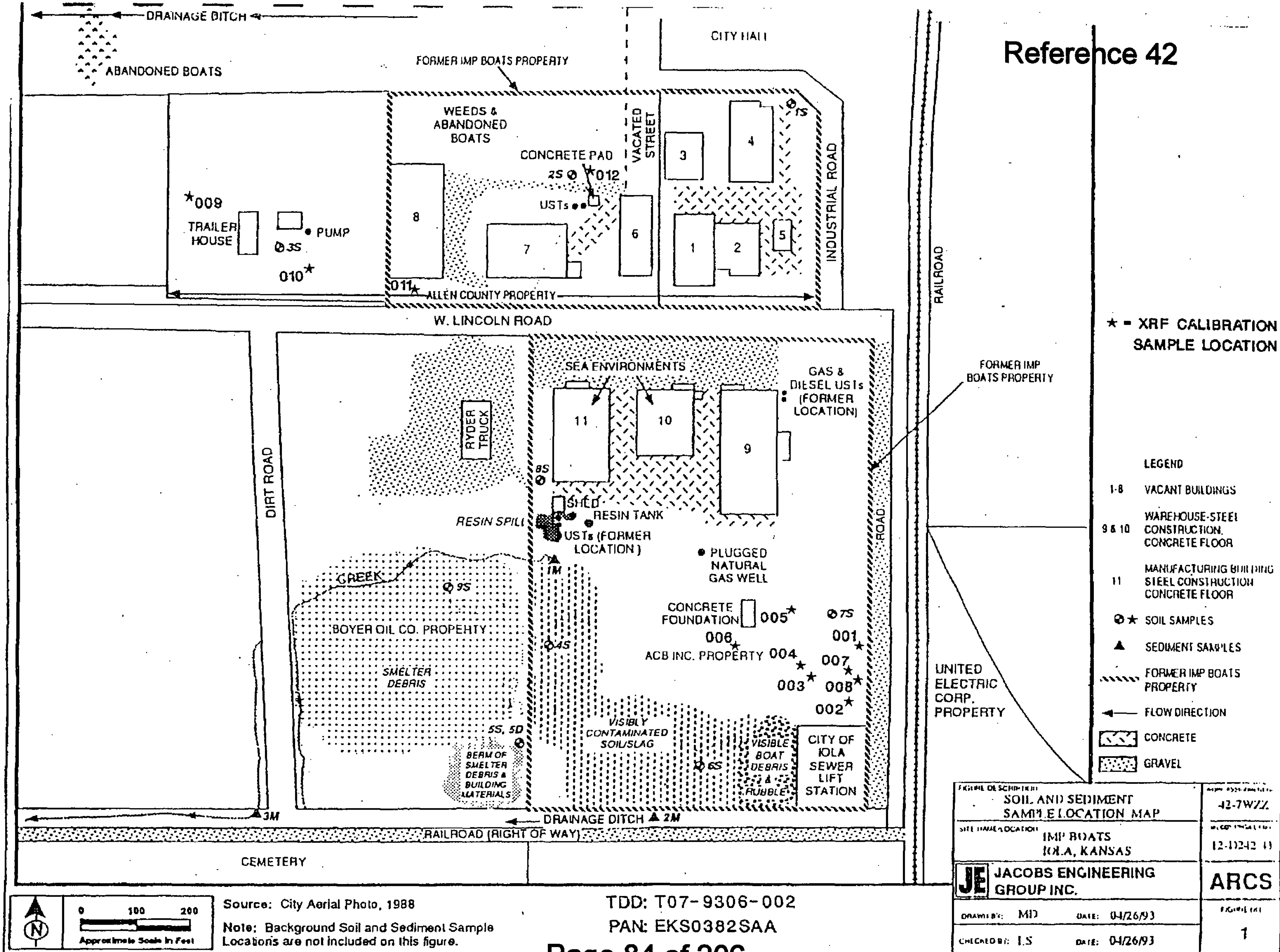
Key to Counties

IMP Boats, Inc.
Iola, KS

Ecology & Environment Inc./TAT
TDD: T07-9306-002
PAN: EKS0382BAA
Prepared by TATM Mark Mayo
October 1993

Figure [illegible] Site Location Map

ATTACHMENT B



Source: City Aerial Photo, 1988

Note: Background Soil and Sediment Sample Locations are not included on this figure.

0242-43-005

TDD: T07-9306-002

PAN: EKS0382SAA

ATTACHMENT C

ANALYSIS REQUEST REPORT VALIDATED DATA

FOR ACTIVITY: RRXKY

BERNARD, J. 08/08/93 12:23:21 ALL REAL SAMPLES AND FIELD Q.C.

* FINAL REPORT

FY: 93 ACTIVITY: RRXKY DESCRIPTION: IMP BOATS LOCATION: IOLA KANSAS

STATUS: ACTIVE TYPE: SAMPLING - IN HOUSE ANALYSIS PROJECT: A37

LABO DUE DATE IS 7/10/93. REPORT DUE DATE IS 12/ 6/93.

INSPECTION DATE: 6/ 9/93 ALL SAMPLES RECEIVED DATE: 06/10/93

ALL DATA APPROVED BY LABO DATE: 06/30/93 FINAL REPORT TRANSMITTED DATE: 00/00/00

EXPECTED LABO TURNAROUND TIME IS 30 DAYS EXPECTED REPORT TURNAROUND TIME IS 180 DAYS

ACTUAL LABO TURNAROUND TIME IS 20 DAYS ACTUAL REPORT TURNAROUND TIME IS 0 DAYS

SITE CODE: KY SITE: IMP BOATS INC.

SAMP. NO.	QCC	M	DESCRIPTION	SAMPLE # STATUS	CITY	STATE	AIRS/ STORET LOC NO	SECT	LAY-ER	BEG. DATE	BEG. TIME	END. DATE	END. TIME
001		S	196'N OF NORTH LIFT STATION FENCE	1	IOLA	KANSAS				06/09/93	11:10	/ /	:
002		S	61'N OF NORTH LIFT STATION FENCE	1	IOLA	KANSAS				06/09/93	11:20	/ /	:
003		S	118'N OF LINE OF NORTH LIFT STATION	1	IOLA	KANSAS				06/09/93	11:30	/ /	:
004		S	145'N OF LINE OF NORTH LIFT STATION	1	IOLA	KANSAS				06/09/93	11:40	/ /	:
005		S	283'N OF LINE OF NORTH LIFT STATION	1	IOLA	KANSAS				06/09/93	11:50	/ /	:
006		S	215'N OF LINE OF NORTH LIFT STATION	1	IOLA	KANSAS				06/09/93	12:00	/ /	:
006	D	S	215'N OF LINE OF NORTH LIFT STAT./DUP.	1	IOLA	KANSAS				06/09/93	12:00	/ /	:
007		S	135'N OF NORTH LIFT STATION FENCE	1	IOLA	KANSAS				06/09/93	12:10	/ /	:
008		S	107'N OF NORTH LIFT STATION FENCE	1	IOLA	KANSAS				06/09/93	12:15	/ /	:
009		S	154'N OF CENTER OF LINCOLN ROAD	1	IOLA	KANSAS				06/09/93	12:50	/ /	:
010		S	90'N OF CENTER OF LINCOLN ROAD	1	IOLA	KANSAS				06/09/93	13:00	/ /	:
011		S	45'N OF CENTER OF LINCOLN ROAD	1	IOLA	KANSAS				06/09/93	13:10	/ /	:
012		S	34'N OF ELN DRIVE NORTH OF BLDG #6	1	IOLA	KANSAS				06/09/93	13:20	/ /	:
013		S	PARK LOCATED AT INTERSECTION OF N.COTT	1	IOLA	KANSAS				06/09/93	14:10	/ /	:

EXPLANATION OF CODES AND INFORMATION ON ANALYSIS REQUEST DETAIL REPORT

SAMPLE INFORMATION:

SAMP. NO. = SAMPLE IDENTIFICATION NUMBER (A 3-DIGIT NUMBER WHICH IN COMBINATION WITH THE ACTIVITY NUMBER AND QCC, PROVIDES AN UNIQUE NUMBER FOR EACH SAMPLE FOR IDENTIFICATION PURPOSES)

QCC = QUALITY CONTROL CODE (A ONE-LETTER CODE USED TO DESIGNATE SPECIFIC QC SAMPLES. THIS FIELD WILL BE BLANK FOR ALL NON-QC OR ACTUAL SAMPLES):
- B = CAL INCREASED CONCENTRATION FOR A LAB SPIKED DUP SAMPLE
- D = MEASURED VALUE FOR FIELD DUPLICATE SAMPLE
- F = MEASURED VALUE FOR FIELD BLANK
- G = MEASURED VALUE FOR METHOD STANDARD
- H = TRUE VALUE FOR METHOD STANDARD
- K = CAL INCREASED CONCENTRATION FOR FIELD SPIKED DUP SAMPLE
- L = MEASURED VALUE FOR A LAB DUPLICATE SAMPLE
- M = MEASURED VALUE FOR LAB BLANK
- N = MEASURED CONCENTRATION OF FIELD SPIKED DUPLICATE
- P = MEASURED VALUE FOR PERFORMANCE STANDARD
- R = CAL INCREASED CONCENTRATION RESULTING FROM LAB SPIKE
- S = MEASURED CONCENTRATION OF LAB SPIKED SAMPLE
- T = TRUE VALUE OF PERFORMANCE STANDARD
- W = MEASURED CONCENTRATION OF LAB SPIKED DUPLICATE
- Y = MEASURED CONCENTRATION OF FIELD SPIKED SAMPLE
- Z = CAL INCREASED CONCENTRATION RESULTING FROM FIELD SPIKE
- 1 = MEASURED VALUE OF FIRST SPIKED REPLICATE
- 2 = MEASURED VALUE OF SECOND SPIKED REPLICATE
- 3 = MEASURED VALUE OF THIRD SPIKED REPLICATE
- 4 = MEASURED VALUE OF FOURTH SPIKED REPLICATE
- 5 = MEASURED VALUE OF FIFTH SPIKED REPLICATE
- 6 = MEASURED VALUE OF SIXTH SPIKED REPLICATE
- 7 = MEASURED VALUE OF SEVENTH SPIKED REPLICATE

M = MEDIA CODE (A ONE-LETTER CODE DESIGNATING THE MEDIA OF THE SAMPLE):
- A = AIR   H = HAZARDOUS WASTE/OTHER
- S = SOLID (SOIL, SEDIMENT, SLUDGE)
- T = TISSUE (PLANT & ANIMAL)
- W = WATER (GROUND WATER, SURFACE WATER, WASTE WATER, DRINKING WATER)

DESCRIPTION = A SHORT DESCRIPTION OF THE LOCATION WHERE SAMPLE WAS COLLECTED

AIRS/STORET LOC. NO. = THE SPECIFIC LOCATION ID NUMBER OF EITHER OF THESE NATIONAL DATABASE SYSTEMS, AS APPROPRIATE

DATE/TIME INFORMATION = SPECIFIC INFORMATION REGARDING WHEN THE SAMPLE WAS COLLECTED
- BEG. DATE = DATE SAMPLING WAS STARTED
- BEG. TIME = TIME SAMPLING WAS STARTED
- END DATE = DATE SAMPLING WAS COMPLETED
- END TIME = TIME SAMPLING WAS COMPLETED

NOTE: A GRAB SAMPLE WILL CONTAIN ONLY BEG. DATE/TIME
A TIMED COMPOSITE SAMPLE WILL CONTAIN BOTH BEG AND END DATE/TIME TO DESIGNATE DURATION OF SAMPLE COLLECTION

OTHER CODES
- V = VALIDATED

ANALYTICAL RESULTS/MEASUREMENTS INFORMATION:

COMPOUND = MGP (MEDIA-GROUP-PARAMETER) CODE AND NAME OF THE MEASURED CONSTITUENT OR CHARACTERISTIC OF EACH SAMPLE

UNITS = SPECIFIC UNITS IN WHICH RESULTS ARE REPORTED:
- C = CENTIGRADE (CELSIUS) DEGREES
- CFS = CUBIC FEET PER SECOND
- GPM = GALLONS PER MINUTE
- IN = INCHES
- I.D. = SPECIES IDENTIFICATION
- KG = KILOGRAM
- L = LITER
- LB = POUNDS
- MG = MILLIGRAMS (1 X 10-3 GRAMS)
- MGD = MILLION GALLONS PER DAY
- MPH = MILES PER HOUR
- MV = MILLIVOLT
- M/F = MALE/FEMALE
- M2 = SQUARE METER
- M3 = CUBIC METER
- NA = NOT APPLICABLE
- NG = NANOGRAMS (1 X 10-9 GRAMS)
- NTU = NEPHELOMETRIC TURBIDITY UNITS
- PC/L = PICO (1 X 10-12) CURRIES PER LITER
- PG = PICOGRAMS (1 X 10-12 GRAMS)
- P/CM2 = PICOGRAMS PER SQUARE CENTIMETER
- SCM = STANDARD CUBIC METER (1 ATM, 25 C)
- SQ FT = SQUARE FEET
- SU = STANDARD UNITS (PH)
- UG = MICROGRAMS (1 X 10-6 GRAMS)
- UMHOS = MICROMHOS/CM (CONDUCTIVITY UNITS)
- U/CC2 = MICROGRAMS PER 100 SQUARE CENTIMETERS
- U/CM2 = MICROGRAMS PER SQUARE CENTIMETER
- 1000G = 1000 GALLONS
- +/- = POSITIVE/NEGATIVE
- # = NUMBER

DATA QUALIFIERS = SPECIFIC CODES USED IN CONJUNCTION WITH DATA VALUES TO PROVIDE ADDITIONAL INFORMATION ON THE REPORTED RESULTS, OR USED TO EXPLAIN THE ABSENCE OF A SPECIFIC VALUE:
- BLANK = IF FIELD IS BLANK, NO REMARKS OR QUALIFIERS ARE PERTINENT. FOR FINAL REPORTED DATA, THIS MEANS THAT THE VALUES HAVE BEEN REVIEWED AND FOUND TO BE ACCEPTABLE FOR USE.
- I = INVALID SAMPLE/DATA - VALUE NOT REPORTED
- J = DATA REPORTED BUT NOT VALID BY APPROVED QC PROCEDURES
- K = ACTUAL VALUE OF SAMPLE IS < VALUE REPORTED
- L = ACTUAL VALUE OF SAMPLE IS > VALUE REPORTED
- M = DETECTED BUT BELOW THE LEVEL OF REPORTED VALUE FOR ACCURATE QUANTIFICATION
- O = PARAMETER NOT ANALYZED
- U = ACTUAL VALUE OF SAMPLE IS < THE MEASUREMENT DETECTION LIMIT (REPORTED VALUE)

ANALYSIS REQUEST DETAIL REPORT ACTIVITY: 3-RRXKY VALIDATED DATA

COMPOUND	UNITS	001	002	003	004	005
SG07 SOLIDS, PERCENT	%	83.8	84.6	84.8	82.1	84.7
SM01 SILVER, TOTAL, BY ICAP	MG/KG	2.08	5.04	9.98	4.54	3.94
SM02 ALUMINUM, TOTAL, BY ICAP	MG/KG	14000	12700	7010	5430	8460
SM03 ARSENIC, TOTAL, BY ICAP	MG/KG	16.1	21.3	85.7	100U	30.0
SM04 BARIUM, TOTAL, BY ICAP	MG/KG	194	258	126	548	254
SM05 BERYLLIUM, TOTAL, BY ICAP	MG/KG	0.850	0.870	0.660	1.00U	0.640
SM06 CADMIUM, TOTAL, BY ICAP	MG/KG	13.6	25.3	427	76.0	51.7
SM07 COBALT, TOTAL, BY ICAP	MG/KG	6.75	9.73	10.6	18.3	9.75
SM08 CHROMIUM, TOTAL, BY ICAP	MG/KG	19.7	12.9	13.3	13.3	11.5
SM09 COPPER, TOTAL, BY ICAP	MG/KG	128	185	346	1040	428
SM10 IRON, TOTAL, BY ICAP	MG/KG	25000	24500	44300	50600	34100
SM11 MANGANESE, TOTAL, BY ICAP	MG/KG	307	786	1710	325	422
SM12 MOLYBDENUM, TOTAL, BY ICAP	MG/KG	0.650	0.940	4.75	4.75	1.67
SM13 NICKEL, TOTAL, BY ICAP	MG/KG	13.4	16.6	20.8	65.1	20.1
SM14 LEAD, TOTAL, BY ICAP	MG/KG	1190	1880	5090	9340	2040
SM15 ANTIMONY, TOTAL, BY ICAP	MG/KG	2.32	2.58	11.6	10.0U	2.13
SM16 SELENIUM, TOTAL, BY ICAP	MG/KG	10.0 U	10.0	19.6	100U	16.7
SM18 THALLIUM, TOTAL, BY ICAP	MG/KG	6.00 U	6.00U	6.00U	60.0U	6.00U
SM19 VANADIUM, TOTAL, BY ICAP	MG/KG	37.8	23.2	24.5	14.1	20.8
SM20 ZINC, TOTAL, BY ICAP	MG/KG	4970	9270	19000	69500	23500
SM21 CALCIUM, TOTAL, BY ICAP	MG/KG	3190	12100	11300	3460	22800
SM22 MAGNESIUM, TOTAL, BY ICAP	MG/KG	1250	2120	993	824	1270
SM23 SODIUM, TOTAL, BY ICAP	MG/KG	192	150	151	101	199
SM24 POTASSIUM, TOTAL, BY ICAP	MG/KG	972	1110	519	400U	669
ZZ01 SAMPLE NUMBER	NA	001	002	003	004	005
ZZ02 ACTIVITY CODE	NA	RRXKY	RRXKY	RRXKY	RRXKY	RRXKY

ANALYSIS REQUEST DETAIL REPORT ACTIVITY: 3-RRXKY VALIDATED DATA

COMPOUND	UNITS	006	006 D	007	008	009
SG07 SOLIDS, PERCENT	%	81.1	79.3	80.7	82.3	73.3
SM01 SILVER, TOTAL, BY ICAP	MG/KG	2.22	2.21	3.25	8.97	2.25
SM02 ALUMINUM, TOTAL, BY ICAP	MG/KG	18300	18500	12800	14400	11100
SM03 ARSENIC, TOTAL, BY ICAP	MG/KG	15.8	19.4	16.8	36.9	10.0U
SM04 BARIUM, TOTAL, BY ICAP	MG/KG	390	402	227	252	194
SM05 BERYLLIUM, TOTAL, BY ICAP	MG/KG	1.26	1.28	0.880	0.990	0.700
SM06 CADMIUM, TOTAL, BY ICAP	MG/KG	51.3	58.6	14.1	31.1	12.0
SM07 COBALT, TOTAL, BY ICAP	MG/KG	18.3	17.4	7.99	9.93	7.07
SM08 CHROMIUM, TOTAL, BY ICAP	MG/KG	16.6	17.3	12.4	13.9	11.8
SM09 COPPER, TOTAL, BY ICAP	MG/KG	380	354	95.6	261	65.7
SM10 IRON, TOTAL, BY ICAP	MG/KG	32100	37400	21400	33000	16800
SM11 MANGANESE, TOTAL, BY ICAP	MG/KG	619	600	711	763	631
SM12 MOLYBDENUM, TOTAL, BY ICAP	MG/KG	1.50	1.42	0.730	1.41	0.690
SM13 NICKEL, TOTAL, BY ICAP	MG/KG	20.8	21.0	15.8	21.4	9.19
SM14 LEAD, TOTAL, BY ICAP	MG/KG	4690	3250	841	2810	639
SM15 ANTIMONY, TOTAL, BY ICAP	MG/KG	1.00U	1.00U	1.68	3.18	2.59
SM16 SELENIUM, TOTAL, BY ICAP	MG/KG	15.0	18.7	10.0U	11.5	10.0U
SM18 THALLIUM, TOTAL, BY ICAP	MG/KG	6.00U	6.00U	6.00U	6.00U	6.00U
SM19 VANADIUM, TOTAL, BY ICAP	MG/KG	32.4	35.5	20.3	25.4	21.4
SM20 ZINC, TOTAL, BY ICAP	MG/KG	25100	25700	4930	12400	2170
SM21 CALCIUM, TOTAL, BY ICAP	MG/KG	5130	5200	4790	6120	12700
SM22 MAGNESIUM, TOTAL, BY ICAP	MG/KG	1680	1700	1920	1830	1750
SM23 SODIUM, TOTAL, BY ICAP	MG/KG	90.0	87.3	117	108	75.7
SM24 POTASSIUM, TOTAL, BY ICAP	MG/KG	1200	1200	1270	1420	2090
ZZ01 SAMPLE NUMBER	NA	006	006	007	008	009
ZZ02 ACTIVITY CODE	NA	RRXKY	RRXKY	RRXKY	RRXKY	RRXKY

ANALYSIS REQUEST DETAIL REPORT ACTIVITY: 3-RRXKY VALIDATED DATA

COMPOUND	UNITS	010	011	012	013	
SG07 SOLIDS, PERCENT	%	81.2	75.0	68.8	73.3	
SM01 SILVER, TOTAL, BY ICAP	MG/KG	0.460	1.83	6.59	0.560	
SM02 ALUMINUM, TOTAL, BY ICAP	MG/KG	11800	12200	8840	9140	
SM03 ARSENIC, TOTAL, BY ICAP	MG/KG	10.0U	10.0U	20.1	10.0U	
SM04 BARIUM, TOTAL, BY ICAP	MG/KG	278	99.0	135	92.3	
SM05 BERYLLIUM, TOTAL, BY ICAP	MG/KG	0.640	0.530	0.460	0.600	
SM06 CADMIUM, TOTAL, BY ICAP	MG/KG	2.01	18.2	40.0	2.71	
SM07 COBALT, TOTAL, BY ICAP	MG/KG	3.99	3.75	8.82	6.74	
SM08 CHROMIUM, TOTAL, BY ICAP	MG/KG	10.3	11.4	13.4	9.06	
SM09 COPPER, TOTAL, BY ICAP	MG/KG	9.36	43.6	226	15.5	
SM10 IRON, TOTAL, BY ICAP	MG/KG	13400	14200	22800	12900	
SM11 MANGANESE, TOTAL, BY ICAP	MG/KG	222	197	562	559	
SM12 MOLYBDENUM, TOTAL, BY ICAP	MG/KG	0.330	0.200U	0.600	0.330	
SM13 NICKEL, TOTAL, BY ICAP	MG/KG	7.39	7.89	14.8	8.34	
SM14 LEAD, TOTAL, BY ICAP	MG/KG	46.1	381	1840	88.5	
SM15 ANTIMONY, TOTAL, BY ICAP	MG/KG	1.00U	1.19	3.94	1.00U	
SM16 SELENIUM, TOTAL, BY ICAP	MG/KG	10.0U	10.0U	10.3	10.0U	
SM18 THALLIUM, TOTAL, BY ICAP	MG/KG	6.00U	6.00U	6.00U	6.00U	
SM19 VANADIUM, TOTAL, BY ICAP	MG/KG	22.4	19.6	15.4	20.5	
SM20 ZINC, TOTAL, BY ICAP	MG/KG	148	2000	11200	363	
SM21 CALCIUM, TOTAL, BY ICAP	MG/KG	21200	52500	145000	39200	
SM22 MAGNESIUM, TOTAL, BY ICAP	MG/KG	2410	2710	4030	2930	
SM23 SODIUM, TOTAL, BY ICAP	MG/KG	79.6	77.5	129	101	
SM24 POTASSIUM, TOTAL, BY ICAP	MG/KG	990	1190	892	1440	
ZZ01 SAMPLE NUMBER	NA	010	011	012	013	
ZZ02 ACTIVITY CODE	NA	RRXKY	RRXKY	RRXKY	RRXKY	

CHAIN OF CUSTODY RECORD
ENVIRONMENTAL PROTECTION AGENCY REGION VII

ACTIVITY LEADER(Print)	NAME OF SURVEY OR ACTIVITY	DATE OF COLLECTION (DAY / MONTH / YEAR)	SHEET
Jamie Bernard-Drakey	IMP Boats	09 / 06 / 93	1 of 1

CONTENTS OF SHIPMENT

SAMPLE NUMBER	CUBITAINER	8 oz BOTTLE	BOTTLE	BOTTLE	VOA SET (2 VIALS EA)	water	soil	sediment	dust	other	RECEIVING LABORATORY REMARKS/OTHER INFORMATION (condition of samples upon receipt, other sample numbers, etc.)
RRXKY-ø41		1					X				
-ø42		1					X				
-ø43		1					X				
-ø44		1					X				
-ø45		1					X				
-ø46		1					X				
-ø46D		1					X				
-ø47		1					X				
-ø48		1					X				
-ø49		1					X				
-ø1ø		1					X				
-ø11		1					X				
-ø12		1					X				
-ø13		1					X				
None To Follow											

(TYPE OF CONTAINERS — NUMBERS OF CONTAINERS PER SAMPLE NUMBER; SAMPLED MEDIA)

DESCRIPTION OF SHIPMENT

14 PIECE(S) CONSISTING OF ______ BOX(ES)

______ ICE CHEST(S); OTHER ______

MODE OF SHIPMENT

______ COMMERCIAL CARRIER: ______

______ COURIER

X SAMPLER CONVEYED

(SHIPPING DOCUMENT NUMBER)

PERSONNEL CUSTODY RECORD

RELINQUISHED BY (SAMPLER)	DATE	TIME	RECEIVED BY	REASON FOR CHANGE OF CUSTODY
[signature] SEALED ☐ UNSEALED ☑	6/10/93	14.40	[signature] SEALED ☐ UNSEALED ☒	Lab Analysis
RELINQUISHED BY SEALED ☐ UNSEALED ☐	DATE	TIME	RECEIVED BY SEALED ☐ UNSEALED ☐	REASON FOR CHANGE OF CUSTODY
RELINQUISHED BY SEALED ☐ UNSEALED ☐	DATE	TIME	RECEIVED BY SEALED ☐ UNSEALED ☐	REASON FOR CHANGE OF CUSTODY

7-EPA-9262(Revised 5/85)

DRAFT FIELD SHEET
U.S. ENVIRONMENTAL PROTECTION AGENCY, REGION VII
ENVIRONMENTAL SERVICES DIV. 25 FUNSTON RD. KANSAS CITY, KS 66115

FY: 93 ACTNO: RRXKY SAMNO: 001 QCC: _ MEDIA: SOIL PL: BERNARD, J.

ACTIVITY DES: IMP BOATS REF LATITUDE: __ __ __
LOCATION: IOLA KS PROJECT NUM: A37 PT: LONGITUDE: __ __ __

SAMPLE DES: Soil Sample #1
LOCATION: IOLA KS

	DATE	TIME	FROM REF PT
BEG:	06/08/93	11:10	EAST:
END:	__/9/__	__:__	NORTH:
			DOWN:

CASE/BATCH/SMO: ____/_/____ LAB: ___
STORET/AIRS NO: ____

ANALYSIS REQUESTED:

CONTAINER	PRESERVATIVE	MGP	NAME
GLASS	ICED	SM	METALS

COMMENTS: FOR SUPERFUND ONLY: SUBSITE IDENTIFIER:___ OPERABLE UNIT:___

XRF calibration sample.

Collected from 0"-2" depth at 196' N of north lift station fence and 35'6" W of center of dirt road on east side of property (ACB).

SAMPLE COLLECTED BY : Parman

DRAFT FIELD SHEET
U.S. ENVIRONMENTAL PROTECTION AGENCY, REGION VII
ENVIRONMENTAL SERVICES DIV. 25 FUNSTON RD. KANSAS CITY, KS 66115

FY: 93 ACTNO: RRXKY SAMNO: 002 QCC: _ MEDIA: SOIL PL: BERNARD, J.

ACTIVITY DES: IMP BOATS REF LATITUDE: __ __ __
LOCATION: IOLA KS PROJECT NUM: A37 PT: LONGITUDE: __ __ __

SAMPLE DES: Soil Sample #2 DATE TIME FROM REF PT
LOCATION: IOLA KS BEG: 06/09/93 11:20 EAST: ____
CASE/BATCH/SMO: ______/_/______ LAB: ___ END: __/__/__ __:__ NORTH: ____
STORET/AIRS NO: ______ DOWN: ____

ANALYSIS REQUESTED:

CONTAINER	PRESERVATIVE	MGP	NAME
GLASS	ICED	SM	METALS

COMMENTS: FOR SUPERFUND ONLY: SUBSITE IDENTIFIER:___ OPERABLE UNIT:___

XRF calibration sample.

Collected from 0"-2" depth at 61'N of north lift station fence and 52' W of center of dirt road on east side of A&B property.

SAMPLE COLLECTED BY : Parman

DRAFT

FIELD SHEET
U.S. ENVIRONMENTAL PROTECTION AGENCY, REGION VII
ENVIRONMENTAL SERVICES DIV. 25 FUNSTON RD. KANSAS CITY, KS 66115

FY: 93 ACTNO: RRXKY SAMNO: 003 QCC: _ MEDIA: SOIL PL: BERNARD, J.

ACTIVITY DES: IMP BOATS REF LATITUDE: __ __ __
LOCATION: IOLA KS PROJECT NUM: A37 PT: LONGITUDE: __ __ __

SAMPLE DES: Soil Sample #3 DATE TIME FROM REF PT
LOCATION: IOLA KS BEG: 06/09/93 11:30 EAST: ____
CASE/BATCH/SMO: ____/_/_____ LAB: ___ END: __/__/__ __:__ NORTH: ____
STORET/AIRS NO: ______ DOWN: ____

ANALYSIS REQUESTED:

CONTAINER	PRESERVATIVE	MGP	NAME
GLASS	ICED	SM	METALS

COMMENTS: FOR SUPERFUND ONLY: SUBSITE IDENTIFIER:___ OPERABLE UNIT:___

XRF calibration sample.

Collected from 0"-2" depth at 118' N of line of north lift station fence and 152' W of center of dirt road on east side of ACB property.

SAMPLE COLLECTED BY : Parman

DRAFT

FIELD SHEET
U.S. ENVIRONMENTAL PROTECTION AGENCY, REGION VII
ENVIRONMENTAL SERVICES DIV. 25 FUNSTON RD. KANSAS CITY, KS 66115

FY: 93 ACTNO: RRXKY SAMNO: 004 QCC: _ MEDIA: SOIL PL: BERNARD, J.

ACTIVITY DES: IMP BOATS REF LATITUDE: __ __ __
LOCATION: IOLA KS PROJECT NUM: A37 PT: LONGITUDE: __ __ __

SAMPLE DES: Soil Sample #4 DATE TIME FROM REF PT
LOCATION: IOLA KS BEG: 06/09/93 11:40 EAST: ____
CASE/BATCH/SMO: ____/__/____ LAB: ___ END: __/__/__ __:__ NORTH: ____
STORET/AIRS NO: ______ DOWN: ____

ANALYSIS REQUESTED:

CONTAINER	PRESERVATIVE	MGP	NAME
GLASS	ICED	SM	METALS

COMMENTS: FOR SUPERFUND ONLY: SUBSITE IDENTIFIER:___ OPERABLE UNIT:___

XRF calibration sample

Collected from 0"-2" depth at 145'N of line of north lift station fence and 182'W of center of dirt road on east side of ACB property.

SAMPLE COLLECTED BY : Parman

DRAFT

FIELD SHEET
U.S. ENVIRONMENTAL PROTECTION AGENCY, REGION VII
ENVIRONMENTAL SERVICES DIV. 25 FUNSTON RD. KANSAS CITY, KS 66115

FY: 93 ACTNO: RRXKY SAMNO: 005 QCC: _ MEDIA: SOIL PL: BERNARD, J.

ACTIVITY DES: IMP BOATS REF LATITUDE: __ __ __
LOCATION: IOLA KS PROJECT NUM: A37 PT: LONGITUDE: __ __ __

SAMPLE DES: Soil Sample #5 DATE TIME FROM REF PT
LOCATION: IOLA KS BEG: 06/09/93 11:50 EAST: ____
CASE/BATCH/SMO: ____/__/____ LAB: ___ END: __/__/__ __:__ NORTH: ____
STORET/AIRS NO: ____ DOWN: ____

ANALYSIS REQUESTED:

CONTAINER	PRESERVATIVE	MGP	NAME
GLASS	ICED	SM	METALS

COMMENTS: FOR SUPERFUND ONLY: SUBSITE IDENTIFIER:___ OPERABLE UNIT:___

XRF calibration sample.

Collected from 0"-2" depth at 283'N of line of north lift station fence and 206'W of center of dirt road on east side of A&B property.

SAMPLE COLLECTED BY : Parman

DRAFT FIELD SHEET

U.S. ENVIRONMENTAL PROTECTION AGENCY, REGION VII

ENVIRONMENTAL SERVICES DIV. 25 FUNSTON RD. KANSAS CITY, KS 66115

FY: 93 ACTNO: RRXKY SAMNO: 006 QCC: _ MEDIA: SOIL PL: BERNARD, J.

ACTIVITY DES: IMP BOATS REF LATITUDE: __ __ __

LOCATION: IOLA KS PROJECT NUM: A37 PT: LONGITUDE: __ __ __

SAMPLE DES: Soil Sample #6 DATE TIME FROM REF PT

LOCATION: IOLA KS BEG: 06/09/93 12:00 EAST: ____

CASE/BATCH/SMO: ____/_/_____ LAB: ___ END: __/__/__ __:__ NORTH: ____

STORET/AIRS NO: _____ DOWN: ____

ANALYSIS REQUESTED:

CONTAINER	PRESERVATIVE	MGP	NAME
GLASS	ICED	SM	METALS

COMMENTS: FOR SUPERFUND ONLY: SUBSITE IDENTIFIER:___ OPERABLE UNIT:___

XRF calibration sample.

Collected from 0"-2" depth at 215'N of line of north lift station fence and 335' W of center of dirt road on east side of ACB property.

SAMPLE COLLECTED BY : Parman

DRAFT FIELD SHEET

U.S. ENVIRONMENTAL PROTECTION AGENCY, REGION VII

ENVIRONMENTAL SERVICES DIV. 25 FUNSTON RD. KANSAS CITY, KS 66115

FY: 93 ACTNO: RRXKY SAMNO: ~~015~~ 006 Z.P. 6/10/93 QCC: D MEDIA: SOIL PL: BERNARD, J.

ACTIVITY DES: IMP BOATS REF LATITUDE: __ __ __

LOCATION: IOLA KS PROJECT NUM: A37 PT: LONGITUDE: __ __ __

SAMPLE DES: Soil Sample #6 (Dup) | DATE | TIME | FROM REF PT

LOCATION: IOLA KS BEG: 06/09/93 12:00 EAST: ____

CASE/BATCH/SMO: ____/__/______ LAB: ___ END: __/__/__ __:__ NORTH: ____

STORET/AIRS NO: ______ DOWN: ____

ANALYSIS REQUESTED:

CONTAINER	PRESERVATIVE	MGP	NAME
GLASS	ICED	SM	METALS

COMMENTS: FOR SUPERFUND ONLY: SUBSITE IDENTIFIER:___ OPERABLE UNIT:___

Duplicate (split) of RRXKY006.

SAMPLE COLLECTED BY : Parker

DRAFT

FIELD SHEET
U.S. ENVIRONMENTAL PROTECTION AGENCY, REGION VII
ENVIRONMENTAL SERVICES DIV. 25 FUNSTON RD. KANSAS CITY, KS 66115

FY: 93 ACTNO: RRXKY SAMNO: 007 QCC: _ MEDIA: SOIL PL: BERNARD, J.

ACTIVITY DES: IMP BOATS REF LATITUDE: __ __ __
LOCATION: IOLA KS PROJECT NUM: A37 PT: LONGITUDE: __ __ __

SAMPLE DES: Soil Sample #7
LOCATION: IOLA KS
CASE/BATCH/SMO: ___/___/___ LAB: ___
STORET/AIRS NO: ___

	DATE	TIME	FROM REF PT	
BEG:	06/09/93	12:10	EAST:	___
END:	__/__/__	__:__	NORTH:	___
			DOWN:	___

ANALYSIS REQUESTED:

CONTAINER	PRESERVATIVE	MGP	NAME
GLASS	ICED	SM	METALS

COMMENTS: FOR SUPERFUND ONLY: SUBSITE IDENTIFIER:___ OPERABLE UNIT:___

XRF calibration sample.

Collected from 0"-2" depth at 135'N of north lift station fence and 50' W of center of dirt road on east side of A<B property.

SAMPLE COLLECTED BY : Parman

DRAFT

FIELD SHEET
U.S. ENVIRONMENTAL PROTECTION AGENCY, REGION VII
ENVIRONMENTAL SERVICES DIV. 25 FUNSTON RD. KANSAS CITY, KS 66115

FY: 93 ACTNO: RRXKY SAMNO: 008 QCC: _ MEDIA: SOIL PL: BERNARD, J.

ACTIVITY DES: IMP BOATS — REF LATITUDE: __ __ __
LOCATION: IOLA KS PROJECT NUM: A37 PT: LONGITUDE: __ __ __

SAMPLE DES: Soil Sample #8 — DATE TIME FROM REF PT
LOCATION: IOLA KS — BEG: 06/09/93 12:15 EAST: ____
CASE/BATCH/SMO: ____/_/____ LAB: ___ END: __/__/__ __:__ NORTH: ____
STORET/AIRS NO: ______ — DOWN: ____

ANALYSIS REQUESTED:

CONTAINER	PRESERVATIVE	MGP	NAME
GLASS	ICED	SM	METALS

COMMENTS: FOR SUPERFUND ONLY: SUBSITE IDENTIFIER:___ OPERABLE UNIT:___

XRF calibration sample.

Collected from 0"–2" depth at 107'N of north lift station fence and 37'6" W of center of dirt road on east side of ACB property.

SAMPLE COLLECTED BY : Parman

DRAFT

FIELD SHEET
U.S. ENVIRONMENTAL PROTECTION AGENCY, REGION VII
ENVIRONMENTAL SERVICES DIV. 25 FUNSTON RD. KANSAS CITY, KS 66115

FY: 93 ACTNO: RRXKY SAMNO: 009 QCC: _ MEDIA: SOIL PL: BERNARD, J.

ACTIVITY DES: IMP BOATS REF LATITUDE: __ __ __
LOCATION: IOLA KS PROJECT NUM: A37 PT: LONGITUDE: __ __ __

SAMPLE DES: Soil Sample #9 DATE TIME FROM REF PT
LOCATION: IOLA KS BEG: 06/09/93 12:50 EAST: ____
CASE/BATCH/SMO: ____/_/____ LAB: ___ END: _/_/__ __:__ NORTH: ____
STORET/AIRS NO: ______ DOWN: ____

ANALYSIS REQUESTED:

CONTAINER	PRESERVATIVE	MGP	NAME
GLASS	ICED	SM	METALS

COMMENTS: FOR SUPERFUND ONLY: SUBSITE IDENTIFIER:___ OPERABLE UNIT:___

XRF calibration sample.

Collected from 0"-2" depth at 154' N of center of Lincoln Road and 69'6" W of west side of trailer house.

SAMPLE COLLECTED BY : Parman

DRAFT FIELD SHEET
U.S. ENVIRONMENTAL PROTECTION AGENCY, REGION VII
ENVIRONMENTAL SERVICES DIV. 25 FUNSTON RD. KANSAS CITY, KS 66115

FY: 93 ACTNO: RRXKY SAMNO: 010 QCC: _ MEDIA: SOIL PL: BERNARD, J.

ACTIVITY DES: IMP BOATS REF LATITUDE: __ __ __
LOCATION: IOLA KS PROJECT NUM: A37 PT: LONGITUDE: __ __ __

SAMPLE DES: Soil Sample #10 DATE TIME FROM REF PT
LOCATION: IOLA KS BEG: 06/09/93 13:00 EAST: ____
CASE/BATCH/SMO: ____/_/_____ LAB: ___ END: __/__/__ __:__ NORTH: ____
STORET/AIRS NO: _____ DOWN: ____

ANALYSIS REQUESTED:

CONTAINER	PRESERVATIVE	MGP	NAME
GLASS	ICED	SM	METALS

COMMENTS: FOR SUPERFUND ONLY: SUBSITE IDENTIFIER:___ OPERABLE UNIT:___

XRF calibration sample.

Collected from 0"-2" depth at 90' N of center of Lincoln Road and 6' E of outbuilding's east side.

SAMPLE COLLECTED BY : Parman

DRAFT

FIELD SHEET

U.S. ENVIRONMENTAL PROTECTION AGENCY, REGION VII
ENVIRONMENTAL SERVICES DIV. 25 FUNSTON RD. KANSAS CITY, KS 66115

FY: 93 ACTNO: RRXKY SAMNO: 011 QCC: _ MEDIA: SOIL PL: BERNARD, J.

ACTIVITY DES: IMP BOATS REF LATITUDE: __ __ __
LOCATION: IOLA KS PROJECT NUM: A37 PT: LONGITUDE: __ __ __

SAMPLE DES: Soil Sample #11 DATE TIME FROM REF PT
LOCATION: IOLA KS BEG: 06/09/93 13:10 EAST: ____
CASE/BATCH/SMO: ____/_/____ LAB: ___ END: __/__/__ __:__ NORTH: ____
STORET/AIRS NO: ______ DOWN: ____

ANALYSIS REQUESTED:

CONTAINER	PRESERVATIVE	MGP	NAME
GLASS	ICED	SM	METALS

COMMENTS: FOR SUPERFUND ONLY: SUBSITE IDENTIFIER:___ OPERABLE UNIT:___

XRF calibration sample.

Collected from 0"-2" depth at 45'N of center of Lincoln Road and 45'W of Bldg #8's east side (see Jacobs map).

SAMPLE COLLECTED BY : Parker

DRAFT FIELD SHEET

U.S. ENVIRONMENTAL PROTECTION AGENCY, REGION VII

ENVIRONMENTAL SERVICES DIV. 25 FUNSTON RD. KANSAS CITY, KS 66115

FY: 93 ACTNO: RRXKY SAMNO: 012 QCC: _ MEDIA: SOIL PL: BERNARD, J.

ACTIVITY DES: IMP BOATS REF LATITUDE: __ __ __
LOCATION: IOLA KS PROJECT NUM: A37 PT: LONGITUDE: __ __ __

SAMPLE DES: Soil Sample #12 DATE TIME FROM REF PT
LOCATION: IOLA KS BEG: 06/09/93 13:20 EAST: ____
CASE/BATCH/SMO: _____/_/______ LAB: ___ END: __/__/__ __:__ NORTH: ____
STORET/AIRS NO: ______ DOWN: ____

ANALYSIS REQUESTED:

CONTAINER	PRESERVATIVE	MGP	NAME
GLASS	ICED	SM	METALS

COMMENTS: FOR SUPERFUND ONLY: SUBSITE IDENTIFIER:___ OPERABLE UNIT:___

XRF calibration sample.

Collected from 0"-2" depth at 34'N of E/W drive north of Bldg #6 (see Jacobs map) and in line with the east side of a cinder block building just north of property line.

SAMPLE COLLECTED BY : Parman

DRAFT FIELD SHEET
U.S. ENVIRONMENTAL PROTECTION AGENCY, REGION VII
ENVIRONMENTAL SERVICES DIV. 25 FUNSTON RD. KANSAS CITY, KS 66115

-Y: 93 ACTNO: RRXKY SAMNO: 013 QCC: _ MEDIA: SOIL PL: BERNARD, J.

ACTIVITY DES: IMP BOATS REF LATITUDE: __ __ __
LOCATION: IOLA KS PROJECT NUM: A37 PT: LONGITUDE: __ __ __

AMPLE DES: Soil Sample #13 (BKgd) DATE TIME FROM REF PT
LOCATION: IOLA KS BEG: 06/09/93 ~~13:30~~ EAST: ____
CASE/BATCH/SMO: ____/_/_____ LAB: ___ END: __/__/__ 14:10 NORTH: ____
TORET/AIRS NO: ______ J.P. 6/9/93 DOWN: ____

ANALYSIS REQUESTED:

CONTAINER	PRESERVATIVE	MGP	NAME
GLASS	ICED	SM	METALS

COMMENTS: FOR SUPERFUND ONLY: SUBSITE IDENTIFIER:___ OPERABLE UNIT:___

XRF calibration sample.

Collected from 0"-2" depth at park located at intersection of N. Cottonwood St. and E. Garfield St.

Offsite background soil sample.

AMPLE COLLECTED BY : Parker

U.S. ENVIRONMENTAL PROTECTION AGENCY

ALTERNATIVE REMEDIAL CONTRACTING STRATEGY

REGIONS VI, VII, VIII

FINAL
SCREENING SITE INSPECTION REPORT
FOR
IMP BOATS, INC.
IOLA, KANSAS

CERCLIS NO. KSD091356857

U.S. EPA CONTRACT NO. 68-W8-0122
U.S. EPA WORK ASSIGNMENT NO. 42-7WZZ
U.S. EPA REGION VII

JACOBS ENGINEERING GROUP INC.
10901 WEST 84TH TERRACE, SUITE 210
LENEXA, KANSAS 66214
(913) 492-9218
JACOBS PROJECT NO. 12-D242-43

SEPTEMBER 1993

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EXECUTIVE SUMMARY

The IMP Boats, Inc. (IMP Boats) site is located at 500 West Lincoln Road in Iola, Kansas and covers approximately 20 acres. The site was discovered when it was owned by IMP Boats, a fiberglass boat manufacturer. The land was originally used by zinc smelting companies in the late 1890s and early 1900s.

In 1896, this property was the site of the first zinc smelter in Kansas. Zinc smelting and brick firing took place on-site. In 1899, the Lanyon Zinc Company was formed, and two of its three smelters were located on this property. The Lanyon Zinc Company was the largest zinc smelter company in the United States, producing 150 tons of spelter (zinc in ingots, slabs, or plates) and 12 tons of zinc each day. The site continued to be used for smelter operations until approximately 1925, under various owners, including J.B. Kirk Gas and Smelting Company and United States Smelting Company.

After 1925, portions of the property were owned and used by many different companies, including the Pet Milk Company, the City of Iola, Iola Molded Plastics, Inc., American Photocopy Equipment Company, and various private owners. Several small businesses have leased the property also. Parts of the property have been used by boat manufacturing businesses since approximately 1950. IMP Boats constructed fiberglass boats at this site for several years. Currently, Sea Environments, a manufacturer of fiberglass boats leases a portion of the site property.

In 1992, the former IMP Boats property (the site) was divided into three separate properties. One of these properties was bought by A.C.B., Inc. (ACB) on November 18, 1992, and Allen county retained ownership of the remaining properties. ACB owns the portion of the site which is located south of West Lincoln Road, and Allen County owns the portion north of West Lincoln Road. The site is located on relatively flat terrain which slopes gently to the west towards the Neosho River, which is approximately eight-tenths of a mile from the site.

The site will be discussed as two distinct sections, the Allen County property and the ACB property. The Allen County property is covered by seven buildings and a former gas pump canopy, which were used by IMP Boats. The remainder of the property is overgrown with weeds, and some areas are covered with gravel. The land in the northwest section of this property also contains many abandoned boats.

The northern portion of the ACB property is the only portion of this site that is currently used. There are three buildings on the property, which are underlain by a concrete pad. The parking area closest to West Lincoln Road is covered with gravel. Two buildings are used by Sea Environments. Sea Environments manufactures fiberglass boats, producing approximately four boats each month. Both Sea Environments and IMP Boats manufacturing operations produced acetone, still bottoms, gel coat, and resin waste. The third building is leased by another small manufacturing company.

The southern two-thirds of the ACB property consists of bare soil without any type of vegetative covering. The soil on the west and south sides of the property is visibly contaminated with slag from smelting operations and has been graded. Smelter waste material, boat, and building remains are spread throughout the soil and extend onto the Boyer Oil Company (Boyer) property, which is located immediately west of the site. The last 100 feet of the southern end of the property is approximately five feet lower in elevation than the rest of the property. The southernmost edge of the property slopes dramatically to the south. There are several areas where the site drains down this slope into a drainage ditch which runs along the right-of-way. There is also a creek that runs from the western portion of the property through the Boyer property to a drainage area along a dirt road.

In December 1992, ACB had two 20-foot by 60-foot pits dug, one along the south side of the property and one along the west side of the property. Fiberglass boat hulls, which remained from IMP Boats operations, were buried in the pit at the south end of the property and burned in the pit at the west end of the property. Both were then filled in and the property was graded. A natural gas well was plugged in December 1992.

Several investigations have been conducted at the site to evaluate the impacts of the zinc smelting operations. An Environmental Risk Assessment was performed on the site by Environmental Engineering Consultants, Inc. for the Iola Bank and Trust. Phase I of the Risk Assessment, which was conducted on November 9, 1990, documented the environmental condition of the property during a site inspection. Based on the findings of Phase I, Phase II was designed to further investigate the zinc smelting operations and the wastes associated with this process. Phase II was conducted in March 1991.

During Phase II, a backhoe was used to collect soil samples at various depths from six locations. Samples were collected from the first foot of soil at each location, and as many as eight samples to a depth of 11 feet were collected at some locations. Samples were analyzed for metals, hydrocarbons, benzene, toluene, ethyl benzene, and xylene (BTEX), volatile organic compounds (VOC), and semi-volatile organic compounds (SVOC). Only metals, cadmium, copper, lead, nickel and zinc, were detected at elevated concentrations. The highest concentrations were detected in the samples collected from the first foot of soil; concentrations decreased rapidly with depth. The sample collected from the northeast corner of the site was designed to provide background data; however, this sample contained elevated levels of cadmium, lead, and zinc. Concentrations of lead were all above 3,300 mg/kg and as high as 32,250 mg/kg. The lowest concentration of zinc detected was 1,350 mg/kg, while most were above 20,000 mg/kg. Five surface soil grab samples were also collected. The five samples detected cadmium ranging from 30 to 273 mg/kg, lead ranging from 193 to 42,800 mg/kg, and zinc ranging from 1,220 to 47,650 mg/kg.

A Preliminary Assessment (PA) was conducted by Kansas Department of Health and Environment (KDHE) in November 1991. It involved a comprehensive target survey, on-site sampling, and site reconnaissance. Three groundwater samples were collected during the PA using a Geoprobe™ Systems, Inc. (Geoprobe™) hydraulic-ram sampling unit. They were collected at depths ranging from 12 to 15 feet below ground surface. Samples were analyzed for VOCs and metals. Concentrations for all samples were below the maximum contaminant level (MCL), except for the sample, which detected dichloromethane at 12.1 $\mu g/L$; the MCL is 5.0 $\mu g/L$. Groundwater samples were collected to determine if soil contaminants were leaching into the shallow aquifer.

On April 20, 1993, Jacobs conducted a SSI at the IMP Boats site. The primary objective of the IMP Boats SSI was to confirm and better define the on-site contaminants and the source areas or which portions of the site had been impacted by the zinc smelting operations. Soil and sediment samples were collected to define a source area, determine if contamination associated with the site extended off-site, and determine surface water migration routes in which contaminants might be transported off-site. Groundwater samples were not collected, because very few wells are located in the area, due to the almost exclusive use of the Neosho River as a water source in Iola and surrounding communities.

Elevated concentrations of lead and all impurities associated with zinc smelting were detected in samples collected from all portions of the site. The highest concentration of lead detected on-site was 12,900 mg/kg. These contaminants were also detected in soil samples collected from two adjacent properties at 23,800 mg/kg. Lead was also detected in the sediment samples at elevated levels comparable to those detected in soil samples. Four of the samples which were analyzed for lead using the Toxicity Characteristics Leaching Procedure (TCLP) contained concentrations of lead which indicate that lead elevated concentrations of may be leaching into water.

FINAL SCREENING SITE INSPECTION REPORT
TASK SUMMARY

SITE:	IMP Boats, Inc. 500 West Lincoln Road Iola, Kansas	
SITE CONTACTS:	Max Snodgrass A.C.B., Inc. President	(316) 365-3125
	Dick Works Allen County Commission Chairman	(316) 365-2921
	Chris Ann Diebolt Sea Environments Secretary/Treasurer	(316) 365-5197
CERCLIS NUMBER:	KSD091356857	
ARCS SITE MANAGER:	Leslie Scally Jacobs Engineering Group Inc.	(913) 492-9218
ARCS ALTERNATE:	Janet Lydigsen Jacobs Engineering Group Inc.	(913) 492-9218
EPA SITE ASSESSMENT MANAGER (SAM):	Pete Culver EPA Region VII	(913) 551-7707
STATE CONTACT:	Danny Cooper Kansas Department of Health and Environment	(913) 296-1674
DATES OF TASKS:	Site Reconnaissance Screening Site Inspection	January 27, 1993 April 20, 1993
LOCATION OF NEAREST TELEPHONE:	Sea Environments	(316) 365-5197

1.0 INTRODUCTION

Under authority of the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA) and the Superfund Amendments and Reauthorization Act of 1986 (SARA), the U.S. Environmental Protection Agency (EPA) Region VII tasked Jacobs Engineering Group Inc. (Jacobs) to conduct a Screening Site Inspection (SSI) at the IMP Boats, Inc. (IMP Boats) site in Iola, Kansas. A Preliminary Assessment (PA) was conducted by Kansas Department of Health and Environment (KDHE) in November 1991. It involved a comprehensive target survey, site reconnaissance, and on-site sampling. An Environmental Risk Assessment was performed by Environmental Engineering Consultants, Inc. for the Iola Bank and Trust. The purpose of the SSI was to review target information and the other investigations which had been completed at the site, to collect environmental samples at IMP Boats sufficient to assess the potential threat posed to human health and the environment. The scope of the investigation included development of a sampling plan, collection of environmental samples, and preparation of a Final SSI Report. The field log notes, a photographic log, chain of custody and field sheets, and the analytical data package are included as appendices to this report.

2.0 SITE DESCRIPTION

2.1 Site Location

IMP Boats is a 20-acre site located at 500 West Lincoln Road in Iola, Allen County, Kansas (Reference 1) (Figure 1). The geographic coordinates of the site are 37°55'38" North Latitude and 95°24'46" West Longitude. The site was discovered by the KDHE on October 31, 1991 when it was owned by IMP Boats, a fiberglass boat manufacturer. The land was originally used by zinc smelting companies in the late 1890s and early 1900s (Reference 2).

In 1992, the former IMP Boats property (the site) was divided into three separate properties. One of these properties was bought on November 18, 1992, by A.C.B., Inc. (ACB), and Allen county retained ownership of the remaining properties. ACB owns the portion of the site which is located south of West Lincoln Road, and Allen County owns the portion north of West Lincoln Road (Reference 3) (Figure 2).

2.2 Site Description

The site is located on relatively flat terrain which slopes gently to the west towards the Neosho River, which is approximately one-half of a mile from the site (Reference 1). The site is approximately two blocks west of U.S. Highway 169 in an industrial park which is not fenced. It is bordered by the Atchison, Topeka and Santa Fe Railroad Tracks to the east. The Missouri Pacific Railroad right-of-way borders the southern edge of the property; the tracks have been removed but the gravel berm remains. The City of Iola owns the property north of the site, city offices are located northeast of the site, but the land north and northwest of the site is open fields. The Boyer Oil Company (Boyer) owns the property west of the site (Reference 4) (Figure 2).

The site will be discussed as two distinct sections, the Allen County property and the ACB property. The Allen County property is covered by seven buildings and a former gas pump canopy, which were used by IMP Boats. All of the buildings have concrete floors, and the area north of Buildings 1, 2, and 5 is also covered with concrete. The remainder of the property is overgrown with weeds, and some areas are covered with gravel (Photograph 1). The land in the northwest section of this property also contains many abandoned boats. The soil is not visibly contaminated, but there is an area on the northeast side of Building 4 where tar appears to have been spilled on the ground. There were two underground storage tanks (UST) and a concrete pad, which appears to have been designed for the storage of drums or other waste containers, located northeast of Building 7 (Photograph 2). During the SSI sampling visit, it was noted that the two USTs had been removed since the site reconnaissance, which took place on January 27, 1993 (Photographs 3 and 4) (Reference 4).

The northern portion of the ACB property is the only portion of this site that is currently used. There are three buildings on the property, which are underlain by a concrete pad extending from the eastern edge of Building 9 to the western edge of Building 11 (Figure 2) (Photograph 5). The parking area closest to West Lincoln Road is covered with gravel. Buildings 10 and 11 are used by Sea Environments, a boat manufacturer, one for storage and one for manufacturing. Building 9 was leased to a small manufacturing company early in 1993 (Reference 4).

The southern two-thirds of the ACB property consists of bare soil without any type of vegetative covering (Photograph 6). The soil on the west and south sides of the property is visibly contaminated with slag from smelting operations and has been graded. Smelter waste material, boat, and building remains are spread throughout the soil and extend onto the Boyer Oil Company (Boyer) property. There is a 20-foot pile of smelter debris and building materials on the southwest corner of the Boyer property. It appears that this waste pile was formed many years ago because a few mature trees are present on the pile. There is a similar pile on the southeast corner of the ACB property, which appears to have been recently formed. The last 100 feet of the southern end of the property is approximately five feet lower in elevation than the rest of the this property. The southernmost edge of the property slopes dramatically to the south property boundary and railroad right-of-way. The right-of-way is approximately 10 feet lower in elevation than the ACB property. There are several areas where the site drains down this slope into a drainage ditch which runs along the right-of-way (Photograph 7). There is also an intermittent creek that runs from the western portion of the property through the Boyer property to a drainage area along a dirt road. These two drainage areas meet at the southwest corner of the Boyer property (Reference 4) (Figure 2). Building rubble covers the southern portion of the Boyer property (Photographs 8, 9, and 10).

In December 1992, ACB excavated two 20-foot by 60-foot pits, one along the south side of the property and one along the west side of the property. Fiberglass boat hulls, which remained from IMP Boats operations, were buried in the pit at the south end of the property and burned in the pit at the west end of the property. Both were backfilled and the property was graded. A natural gas well, which is located southwest of Building 9, was plugged in December 1992 (Photograph 11) (Reference 5). Sometime between the site reconnaissance and the SSI visits, fill material had been spread on the land immediately south of the concrete pad on which Buildings 9, 10, and 11 are built. The fill, which was material excavated during a local highway project, extends west from Building 9 until approximately the middle of Building 11 (Reference 4). There is an aboveground resin storage tank south of Building 11 (Photograph 12). The ground west of the resin tank is covered with dried resin. There is a portion of an old building foundation approximately 150 feet south of Building 9, which may be the remains of a building from the smelting companies (References 4 and 6).

2.3 Operating History

The Lanyon Zinc Company had two smelters, Works No. 1 and Works No. 2, that were located on the land which is now the IMP Boats site (Figure 3). According to Sanborn Fire Maps from 1899 and 1905, Works No. 1 was located in the center of what is now the ACB property, and approximately half of the buildings which comprised Works No. 2 were located in the northeastern and central portions of the Allen County property. The remainder of Works No. 2 was located on the land north of the site (Reference 6).

In 1896, the site was home to the first zinc smelter in Kansas. Zinc smelting and brick firing took place on-site. In 1899, the Lanyon Zinc Company was formed, and two of its three smelters were located on this property (Figure 3). The Lanyon Zinc Company in Iola, Kansas owned the largest zinc smelter in the United States, producing 150 tons of spelter (zinc in ingots, slabs or plates) and 12 tons of zinc each day. The site continued to be used for smelter operations until approximately 1925, under various owners, including the J.B. Kirk Gas and Smelting Company and the United States Smelting Company.

After 1925, portions of the site were owned and used by many different companies, including the Pet Milk Company, the City of Iola, Iola Molded Plastics, Inc., American Photocopy Equipment Company, and various private owners (Reference 3). Several small businesses have also leased the property. Parts of the site have been used by boat manufacturing businesses since approximately 1950, and this use continues today (Reference 4).

IMP Boats constructed fiberglass boats at this site for several years. Currently, two buildings on the ACB property are leased by Sea Environments. Sea Environments manufactures fiberglass boats, producing approximately four boats each month (Reference 4). The boat manufacturing operations produce acetone, still bottoms, gel coat, and resin waste (Reference 2).

2.4 Previous Investigations

An Environmental Risk Assessment (ERA) was performed on the site by Environmental Engineering Consultants, Inc. for the Iola Bank and Trust. Phase I of the ERA, which was conducted on November 9, 1990, documented the environmental condition of the property during a site inspection. Based on the findings of Phase I, Phase II was conducted in March 1991. It was designed to further investigate the zinc smelting operations and the wastes associated with this process. One area of focus was the southern and western edges of the property which contains large quantities of waste smelter material (Reference 7).

During Phase II, a backhoe was used to collect soil samples at various depths from six locations. Samples were collected from the first foot of soil at each location, and as many as eight samples to a depth of 11 feet were collected at some locations. Samples were analyzed for metals, hydrocarbons, benzene, toluene, ethyl benzene, and xylene (BTEX), volatile organic compounds (VOC), and semi-volatile organic compounds (SVOC). Only metals, cadmium, copper, lead, nickel and zinc, were found at elevated concentrations (Figure 4 depicts previous sampling locations and summarizes contaminants that were detected). The highest concentrations were found in the samples collected from the first foot of soil; concentrations decreased rapidly with depth. The sample collected from the northeast corner of the site was designed to provide background data; however, this sample contained elevated levels of cadmium, lead, and zinc. The sample collected from the northwest corner of the site generally contained the lowest concentrations of all the samples collected. These concentrations included: cadmium at 15 parts per million (ppm), lead at 392 ppm, and zinc at 1,350 ppm. Samples collected from the first foot of soil at the five other locations had detected concentrations of cadmium ranging from 95 to 147 ppm. Concentrations of lead were all above 3,300 ppm and as high as 32,250 ppm. The lowest concentration of zinc detected was 1,350 ppm, while most were above 20,000 ppm. Five of the holes which were formed as a result of the backhoe sampling were left open and collected water overnight. This water was sampled, and the water collected from the northeast corner of the site detected 48 ppm of cadmium, 38 ppm of lead, and 200 ppm of zinc. Five surface soil grab samples were also collected. The five samples detected cadmium ranging from 30 to 273 ppm, lead ranging from 193 to 42,800 ppm, and zinc ranging from 1,220 to 47,650 ppm (Reference 7).

A Preliminary Assessment (PA) was conducted by KDHE in November 1991. It involved a comprehensive target survey, on-site sampling, and site reconnaissance. Three groundwater samples were collected during the PA using a Geoprobe™ hydraulic-ram sampling unit. They were collected at depths ranging from 12 to 15 feet below ground surface (Figure 4). Samples were analyzed for VOCs and metals. Concentrations for all samples were below the maximum contaminant level (MCL), except for the sample collected at the southwest corner of Building 11, which detected dichloromethane at 12.1 parts per billion (ppb); the MCL is 5.0 ppb. This groundwater sample was collected to determine if heavy metals were leaching into the shallow aquifer. The other two samples were collected adjacent to the USTs. Attempts were also made to obtain groundwater samples in the vicinity of the gasoline and diesel tanks on the east side of the site, but no water was ever obtained (Reference 13).

Based on the findings of the PA, KDHE determined that groundwater contamination would not affect any nearby receptors. Groundwater is not a source of drinking water in the area. However, the extent of soil contamination was identified as a potential threat through the surface water and air pathways. This determination was influenced by the following facts: 1) the site is only one-half of a mile from the Neosho River and its tributaries, thus there is a potential for migration of cadmium and lead off-site through surface water runoff; 2) the river serves as a source for drinking water, fishing, and as a habitat for state-endangered and threatened species; and 3) airborne transport of fine particles off-site represents a potential threat of exposure to humans, animals, and plant life in the vicinity of the site.

2.5 Project Objectives

The SSI was designed to provide the EPA with a preliminary screening of the site which facilitates the assignment of site priorities. As part of the site assessment process, the SSI is conducted in conjunction with Revised Hazard Ranking System (HRS) (Federal Register, December 14, 1990) scoring to determine whether the site has the potential to be included on the National Priorities List (NPL). The SSI focused on:

- Determining Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) eligibility
- Documenting the presence, quantity and type, or absence, of uncontained or uncontrolled hazardous substances on-site
- Collecting area receptor and site characteristics information.

The primary objective of the IMP Boats SSI was to confirm and better define the on-site contaminants and the source areas, or which portions of the site had been impacted by the zinc smelting operations. Associated sampling was designed to determine if contamination associated with the site extended off-site, and determine surface water migration routes in which contaminants might be transported off-site.

2.6 Waste Characteristics

The site was used by zinc smeltering companies from 1896 until approximately 1925. Zinc must be separated and extracted from ores before it is refined and prepared to a usable form. The usual impurities found in zinc ores are lead, cadmium, and iron. Copper, silver, arsenic, and antimony may also be present. All of these metals have been detected in samples collected from the on-site soils (Reference 7). The results from previous investigations, which have included soil and groundwater sampling, are summarized in Section 2.4 and Figure 4.

Both Sea Environments and IMP Boats constructed fiberglass boats. Acetone, still bottoms, gel coat, and resin were either used during or generated as a result of these operations (Photograph 12). There were six USTs on-site which were used for storage of acetone, gasoline, and diesel fuel. According to the KDHE Underground Storage Tank System Facility Information database, all six were installed between 1961 and 1973 and range from 500 gallons to 5,000 gallons (Reference 8). In December 1992, the four tanks located on the ACB property (Figure 2) were removed. The KDHE provided oversight during these removals (Reference 9).

Polynuclear Aromatic Hydrocarbons (PAH) may also be found on-site. PAHs are formed from incomplete combustion, thus they may be found on the western portion of the site where the boats were burned in December 1992.

2.6.1 Cadmium

Cadmium is a silver-white metal that is found naturally in the earth's crust. It is not usually found in the environment as a metal, but instead as a mineral combined with other elements. Most cadmium is extracted during the production of other metals, i.e., zinc, lead, or copper. It is used in many products such as batteries, pigments, metal coatings, and plastics. The Occupational Safety and Health Administration (OSHA) limits workplace air to 200 $\mu g/m^3$ of cadmium dust. Cadmium is classified as a Class D carcinogen. Mean levels of cadmium in uncontaminated topsoil in the United States (U.S.) are approximately 0.25 mg/kg. The concentrations of cadmium in U.S. topsoil typically range from 0.1 to 1.0 mg/kg. Humans are most likely to be exposed to cadmium by ingestion of plants which are grown in contaminated soil. Plants uptake cadmium from the soil. Soil can become contaminated by deposition of airborne cadmium (Reference 10). The EPA's Safe Drinking Water Act (SDWA) MCL for cadmium in drinking water is 5.0 $\mu g/L$ (Reference 11). Elemental cadmium is insoluble; however, various compounds containing cadmium range from practically insoluble to quite soluble. The densities of cadmium and cadmium compounds are greater than the density of water (Reference 10).

2.6.2 L ad

Lead is a naturally occurring bluish-gray metal found in small amounts in the earth's crust. Almost all lead-producing mines in the U.S. are underground operations. Lead can also be recovered from secondary sources, such as scrap, product wastes, refinery dross, and residues. Battery scrap is converted to impure lead or lead alloys by pyrometallurgical processes employing blast, reverberatory, and/or rotary furnaces. Lead is used in the production of batteries, ammunition, metal products (sheet lead, solder, and pipes), paint, and to some extent, it is found as an additive in gasoline, but the quantity and frequency of use has greatly decreased with increased knowledge about lead's harmful effects on humans and animals. Elemental lead is insoluble in water and has a density of 11.34 $\mu g/cm^3$ (Reference 12). Lead has been classified as a B2 (probable) human carcinogen. The SDWA MCL action level for lead is 15 $\mu g/l$ (Reference 11). The natural content of lead in the soil is usually less than 30 mg/kg (Reference 12).

2.6.3 Zinc

Zinc is a metal which is distributed throughout the earth's crust. Although it is not usually found free in nature, zinc compounds are found naturally in the air, soil and water. The primary sources of zinc in the environment are related to metallurgic wastes from smelter and refining operations. Zinc is strongly sorbed to soil and sediment. Zinc is found in soils at concentrations between 10 mg/kg and 300 mg/kg. Elemental zinc is essential to humans in low doses, but it can be harmful at higher concentrations. Zinc is a Class D carcinogen. A secondary MCL of 5,000 $\mu g/L$ has been established for zinc.

2.6.4 Polynuclear Aromatic Hydrocarbons

PAHs are a group of chemical compounds formed from the incomplete combustion of coal, oil and gas, garbage, or other organic substances (Reference 14). PAHs have also been associated with smelting operations. PAH compounds include acenaphthene, acenaphthalene, anthracene, benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(g,h,i)perylene, benzo(k)fluoranthene, chrysene, dibenzo(a,h)anthracene, fluoranthene, fluorene, indeno(1,2,3-cd)pyrene, 2-methylnaphthalene, naphthalene, phenanthrene, and pyrene. PAHs do not burn easily and are very persistent as they will last in the environment for months or years. As pure chemicals, PAHs exist as colorless, white, or pale yellow-green solids. PAHs also are present in crude oil, coal, coal tar pitch, creosote, and roofing tar. Most PAHs do not dissolve easily in water, but some volatilize. In surface water, they can volatilize, photodegrade, oxidize, biodegrade, bind to particulates, or accumulate in aquatic organisms. PAH compounds have low solubility and their densities are greater than water. In sediments, PAHs can biodegrade or accumulate in aquatic organisms. PAHs in soil can biodegrade or accumulate in plants (Reference 14).

3.0 GROUNDWATER PATHWAY

3.1 Local Geology/Hydrologic Setting

Allen County lies within the Osage Plains section of the Central Lowlands physiographic province and includes an area of about 504 square miles. Formations above the Pre-Cambrian basement complex have an average thickness of 2,000 feet and are all sedimentary in origin. The consolidated deposits range in age from Cambrian through Pennsylvanian, and the unconsolidated deposits range in age from probable Tertiary through Quaternary. Formations of Pennsylvanian, Tertiary, and Quaternary age are exposed in the county. The exposed Pennsylvanian Formations have a regional dip to the northwest of about 12 to 15 feet per mile (Reference 15).

The most important bedrock aquifers in Allen County are the shallow Pennsylvanian limestones and sandstones that have been weathered along joints, fractures, and bedding planes. Potable groundwater is usually not found below the base of the Kansas City Group. In many places, the boundary between fresh and saline water is present in the younger formations (Reference 15).

The IMP Boats site lies on the unconsolidated alluvial sediments of Quaternary age that have been deposited in the Neosho River Valley. These deposits have an average thickness of 25 feet and generally yield good quantities of very hard water. An overlying silt layer in the valley forms a confining bed, which contributes to artesian conditions in the aquifer throughout much of the valley. Illinoisan terrace deposits drape the upper heights of the flood plain and may also produce moderate amounts of potable groundwater.

Groundwater has been observed at 3.5 to 12 feet across the site. Groundwater flow is presumed to be toward the west-southwest due to the effect of regional dip in the topography and the Neosho River (Reference 2).

3.2 Groundwater Targets

The water supply for Iola, Kansas and much of the surrounding area is derived from intakes on the Neosho River. The city water supply supplies multiple rural water districts surrounding Iola (Reference 16), thus groundwater is not a widely used source of drinking water in the area. According to information provided by the KDHE, there are only ten registered wells within four miles of the site (Reference 17). These wells range in depth from 32 feet to 79 feet below ground surface (bgs), and are completed into the weathered Pennsylvanian limestones. The nearest drinking water well identified is located approximately one mile south of the site. According to the owner of the well, the pump has been removed (Reference 25) and the well has not been used for approximately ten years. The other wells identified during the well search were upgradient of the site or located greater than one mile from the site. There is a well at the sewer lift station which is located at the southeast corner of the site which is owned by the city. It is approximately 25 feet bgs. It is used to supply water to flush city sewer lines. It was not sampled because it is not used for drinking water (Reference 18).

3.3 Groundwater Sample Locations and Analysis

Groundwater samples were not collected during the SSI, because drinking water wells were not identified in the vicinity of the site. Three shallow groundwater samples were collected during the PA using a Geoprobe™, as discussed in Section 2.4. Samples were collected at the southwest corner of Building 11, near the two USTs south of Building 11, and near the two USTs northeast of Building 7. The samples were analyzed for metals and VOCs.

The results of this sampling effort are shown in Figure 4. Cadmium was detected in the two samples collected near Building 11 at 3.0 $\mu g/L$ and 2.0 $\mu g/L$. The MCL for cadmium is 5 $\mu g/L$. 1,2-Dichloroethylene, trichloroethylene, and tetrachloroethylene (PCE) were also detected in the sample collected near the USTs by Building 11. Dichloromethane was also detected in the sample collected southwest of Building 11, and PCE was detected in the sample collected near Building 7 (Reference 2). Dichloromethane was detected at 12.1 $\mu g/L$, exceeding its MCL of 5.0 $\mu g/L$ (References 2 and 11).

3.4 Groundwater Conclusions

The samples collected by KDHE indicate a release of site contaminants to the groundwater. The source of VOCs detected in these samples is not known.

4.0 SURFACE WATER PATHWAY

4.1 Hydrologic Setting

The IMP Boats site is located approximately one-half of a mile east of the Neosho River (Reference 1). The site is located within the 500-year flood zone (Reference 2). The annual mean flow of the Neosho River near Iola, for the period of record from 1899 to 1992 is 1,797 cubic feet per second (cfs) (Reference 19).

The surface water migration pathway consists of overland flow from the site to multiple drainageways on and bordering the site. There is one intermittent creek, which begins on the western edge of the property, flowing west and transversing the Boyer property to a dirt road (Figure 5). There is a drainageway along the southern edge of the property, which also flows into ditches along the dirt road. Generally, the land slopes gently west and towards the Neosho River. Precipitation deposited on the southern third of the property will flow to the south into the drainageway. Surface water drainage pathways associated with the site flow to the west and then southwest. This overland flow route is approximately nine-tenths of a mile to the Neosho River. The probable point of entry (PPE) for the surface water pathway is on the Neosho River, approximately one-half of a mile downstream of Iola's drinking water intake. The 15-mile target distance limit for the surface water migration pathway occurs approximately three miles south of Humboldt on the Neosho River (Reference 1).

4.2 Surface Water Targets

The Neosho River is approximately eight-tenths of a mile west of the site. It is used as a municipal drinking water source and as a fishery. The City of Iola has one intake on the river, immediately north of Highway 54. The city water system supplies approximately 11,500 people with water, approximately 6,500 in Iola and between 4,000 and 5,000 rural water district customers (Reference 16). However, based on the intermittent stream flow patterns discussed earlier, it is not believed that the site will impact Iola's water intake. Humboldt, which is located 11.5 miles downstream, also has an intake on the river. The City of Humboldt serves approximately 2,500 municipal and rural customers (Reference 20).

The Neosho River is used for recreational fishing. Species known to live in the river include white bass, spotted bass, flathead catfish, crappie, channel catfish, and bullhead (Reference 2). The Neosho madtom (*Notorus placidus*), a federally-listed threatened species, lives in the Neosho River. The Neosho River, from the Highway 54 bridge extending south through the point 15 miles downstream of the PPE, is a state-designated critical habitat for the Neosho madtom (Reference 21). The bald eagle (*Haliaeetus leucocephalus*) and the peregrine falcon (*Falco peregrinus*) may be present in the area, and both are listed as federal-endangered species (Reference 22).

4.3 Sediment Sample Locations and Analysis

Sediment samples were collected from three drainage areas (Figure 6). Table 1 summarizes the rationale for each of the sediment sample locations. Sediment samples were analyzed for total metals and percent solids. Sample location 2M (EPA ID No. CSXKY-008) was located in the drainage ditch along the southern edge of the ACB property. Sample location 3M (EPA ID No. CSXKY-007) was located at the beginning of a drainageway which flows to the west across the Boyer property. Both of these samples represent the beginning of the overland flow segment of the surface water pathway, in which contaminants could be transported off-site and eventually to the surface water pathway. Sample location 3M (EPA ID No. CSXKY-009) was approximately 700 feet west of 2M. The two surface water drainage pathways meet at sample location 3M. A background sediment sample, 4M (EPA ID No. CSXKY-010) was located upgradient of the site, from Coon Creek northwest of Jackson Road and U.S. Highway 69 (Photograph 13) (Figure 1). Sediment samples were analyzed for percent solids and total metals (Table 1).

4.4 Sediment Analytical Results

The results of these analyses are shown on Table 2. The entire data package is presented in Appendix B. The highest concentration of lead detected was at sample location 2M at 7,640 mg/kg. This concentration is nine times greater than the concentration detected in the background sample 4M (77.8 mg/kg). Lead was also detected at 3,000 mg/kg and 2,960 mg/kg from sample locations 1M and 3M, respectively. Concentrations of zinc ranged from 9,060 mg/kg to 22,400 mg/kg, and concentrations of cadmium ranged from 60 mg/kg to 296 mg/kg. The background concentrations of zinc and cadmium in background sample location 4M were 216 mg/kg and 1.99 mg/kg, respectively. Arsenic and aluminum were also detected at concentrations well above background.

4.5 Surface Water Conclusions

The data indicate that the waste products associated with the zinc smelting operations, mainly cadmium, lead, and zinc, were detected in sediment samples collected from intermittent drainage pathways at concentrations exceeding background levels. The concentrations of metals detected at sample locations 1M and 3M were often comparable, while concentrations detected at sample location 2M were generally higher. All metals concentrations were above those detected in the background sample, except concentrations of calcium, magnesium, and sodium.

5.0 SOIL AND AIR PATHWAYS

5.1 Physical Conditions

The southern two-thirds of the ACB property consists of bare soil without any type of vegetative covering. The soil on the west and south sides of the property is visibly contaminated with slag from smelting operations and has been graded. Smelter waste material, boat, and building remains are spread throughout the soil and extend onto the Boyer property. The majority of the large waste and debris is concentrated on the Boyer property. It appears that these waste piles were formed many years ago because mature trees are present on the pile and the Boyer property is quite overgrown. The portion of the site which is owned by Allen County is mainly covered with gravel and dirt roads, however, there are a few areas where grass grows.

According to the Allen County Soil Survey, the soils in this portion of Iola are of the Zaar Series. This soil is characterized by gently sloping, silty clays. Permeability is low (Reference 23). Due to the large amounts of slag and debris on-site, especially on the ACB property, soil characteristics may differ from this description. The surface soils on the ACB property appeared to drain rapidly.

5.2 Soil and Air Targets

The site is located on the edge of the industrial and commercial portion of Iola, thus there are a limited number of targets associated with these two pathways. There is one trailer home within 200 feet of the site. Eleven people are employed by Sea Environments and approximately five are employed by the manufacturing company which is leasing Building 9. The number of individuals residing within one-quarter of a mile of the site is uncertain, but based on review of the site logbook and a topographic map of the area, it is assumed to be less than 100. The population within radii of one-quarter to one-half, one-half to one, one to two, two to three, and three to four miles is 1,295, 2,541, 3,268, 886, and 570, respectively (Figure 7) (Reference 23). The summation of the population within four miles of the site is 8,592. Three potential sensitive environments were identified within four miles of the site: the designated critical habitat area for the Neosho madtom, which was discussed above, and the occurrence of Mead's milkweed (*Asclepias meadii*), a federally-threatened species and the fluted shell (*Lasmigona costata*), a state-threatened species (Reference 22). None of these sensitive environments are present on-site.

The threat of exposure to contaminated soils exists at the IMP Boats site due to elevated concentrations of cadmium and lead in on-site soils. However, there are a limited number of residents in the immediate vicinity. The site is not fenced; access is not restricted. The potential exists for on-site workers to be directly exposed to contaminated soils. There are businesses and city offices immediately north and east of the site.

5.3 Soil Sample Locations and Analysis

Samples were collected from six on-site and three off-site locations (Figures 1 and 6). All of the samples were discrete samples, collected from the top zero to six inches of soil. The background soil sample location 10S (EPA ID No. CSXKY-011), was collected from the front lawn of the Allen County Community College. All soil samples were analyzed for total metals and percent solids; selected samples were also analyzed for SVOCs and/or Toxicity Characteristics Leaching Procedure (TCLP) metals. The rationale for each sample location and the associated analyses is presented in Table 1.

The two samples, 1S (EPA ID No. CSXKY-002) and 2S (EPA ID No. CSXKY-012), collected from the portion of the site which is owned by Allen County property were designed to confirm the results of sampling conducted during the ERA. Both of these samples were collected from portions of the site where the zinc smelter stood.

Six of the soil samples, including two which were collected from the Boyer property, were collected in areas of visible waste deposition. Sample locations 4S (EPA ID No. CSXKY-014), 6S (EPA ID No. CSXKY-013) and 7S (EPA ID No. CSXKY-004) were in areas where the soil was visibly covered with slag and much darker in color with a gritty, grainy texture. Buried batteries were observed near sample location 7S (Photograph 14). Sample locations 5S and 5D, a duplicate, (EPA ID Nos. CSXKY-015, CSXKY-015D, respectively) were collected from the edge of the large slag pile in the southeastern corner of the Boyer property. All five of these samples were analyzed for TCLP metals, in addition to total metals and percent solids. Samples collected from sample locations 4S, 5S, and 5D were also analyzed for PAHs, because they were collected from the western portion of the site where boats were burned.

Sample location 8S (EPA ID No. CSXKY-005) was moved to the southwest corner of Building 11 to confirm the results of a sample collected during the Environmental Risk Assessment. The sample collected from sample location 9S (EPA ID No. CSXKY-006) was collected to determine if the soil contamination caused by the smelting operations extended onto the Boyer property. Sample location 9S was also revised, because the southern half of the property is covered with large pieces of building materials and slag from the smelter. It was impossible to collect a sample from the location which had originally been selected because the ground is completely covered by debris. The sample was collected north of the planned location. A sample location, 3S (EPA ID No. CSXKY-003), was collected from the lawn of the property on which the trailer home is located, to determine if there was soil contamination within 200 feet of the trailer home.

5.4 Soil Analytical Results

All of the impurities associated with zinc ore, which were discussed in Section 2.6, were detected in the soil samples well above background concentrations. The metal concentrations detected in the soil samples are presented in Table 2. Lead is the contaminant of most concern, due to the concentrations detected throughout the site and because it is known to be carcinogenic, teratogenic, and mutagenic. It was detected at concentrations ten times the background concentrations of 67.8 mg/kg in all but one sample and at concentrations almost 100 times the background sample in six of the nine soil samples.

Samples in the boat burn area collected from locations 4S, 5S, and 5D and the background soil sample location 10S, underwent analyses for semi-VOCs, to determine if the soil contained PAHs. No semi-VOCs were detected in the samples collected at these locations. Detection limits generally ranged from 396 to 460 μg/kg.

Samples collected from locations 2S, 4S, 5S, 5D, and 6S also underwent analyses for TCLP metals. A solid waste is considered hazardous based on the following characteristics: ignitability, corrosivity, reactivity, and toxicity. Toxicity is determined using the TCLP. If the extract from a representative sample of solid waste contains any of the contaminants listed in CFR 261.24 (Table 1) at concentration equal to or greater than the established regulatory limits, the solid waste exhibits the characteristic of toxicity. The TCLP determines the mobility of inorganic and organic analytes in any medium. It identifies waste constituents likely to be released from the source to groundwater. The results are presented in Table 3. Lead and cadmium were detected at concentrations exceeding the regulatory limits. The regulatory limit for cadmium is 1.0 mg/L, and it was detected at 1.05 mg/L in the sample collected at location 6S. Lead was detected at concentrations well above the regulatory limit of 5.0 mg/L in the samples collected from locations 4S, 5S, 5D, and 6S. Concentrations ranged from 32.2 mg/L to 85.2 mg/L. Lead was not detected above the detection limit of 0.168 mg/L in the sample from location 2S.

A matrix spike and matrix spike duplicate were analyzed by the analytical laboratory for sample No. CSXKY-006 (sample 006), which was collected at location 9S. The recoveries for both spikes were out of control; the laboratory control sample was in control. These recoveries were attributed to matrix effects caused by the elevated concentrations of iron, aluminum, zinc and lead in sample 006. Exact concentrations cannot be reported for those elements with matrix spike and spike duplicates which were out of control; however, maximum and minimum concentrations can be defined with relative certainty. The ranges determined by the laboratory are included as Table 1 in the analytical data package which is included as Appendix B to this report. The recovery for silver, beryllium, molybdenum, antimony, selenium, calcium, magnesium and potassium exceeded the upper control limits. For these elements the high end of the range was reported as the concentration of each element detected in the sample. The spike recovery for aluminum was below the lower control limit, thus the low end of the range was reported as the concentration detected in the sample.

5.5 Soil Conclusions

The results of the soil sampling indicate that heavy metals associated with the site are present at elevated concentrations in on-site surface soils. These elevated metal concentrations extend to the Boyer property and the Allen county property, on which the trailer home is located. The threat to local residents via direct contact is limited due to the location of the site in an industrial/commercial area. The soil contains metals at elevated concentrations throughout the site, thus these metals pose a threat to workers employed by the two businesses located on the ACB property and any future land use on either the ACB or Allen County properties.

6.0 SSI CONCLUSIONS

On April 20, 1993, Jacobs conducted a SSI at the IMP Boats site. The primary objective of the IMP Boats SSI was to confirm the existence of on-site contaminants and better define the portions of the site which have been impacted by the zinc smelting operations. Soil and sediment samples were collected to define a source area, determine if contamination associated with the site extended off-site, and determine surface water migration routes in which contaminants might be transported off-site. Groundwater samples were not collected, because very few wells are located in the area, due to the almost exclusive use of the Neosho River as a water source in Iola and surrounding communities.

Elevated concentrations of lead and all other impurities associated with zinc smelting were detected in samples collected from all portions of the site. The highest concentration of lead on-site was detected in sample location 6S at 12,900 mg/kg. These contaminants were also detected in soil samples collected from two adjacent properties. Lead was detected at 23,800 mg/kg in a sample collected from the Boyer property. Lead was also detected at 543 mg/kg in a sample collected from the Allen County property on which the trailer is located. It should be noted that the Boyer property and the county property are located outside the current IMP Boats Inc. site boundary. In the event that further work is contemplated at this site, consideration should be given to amending the site boundaries to encompass the entire area of known contamination. Four of the samples were analyzed for metals using the TCLP-contained concentrations of lead which exceed regulatory TCLP limits for determining the toxicity of solid wastes. Lead was also detected in the sediment samples at elevated levels comparable to those detected in soil samples.

Based on the results of the groundwater sampling conducted by KDHE, there has been a release of on-site contaminants to groundwater. Cadmium was detected at 2.0 μg/L and 3.0 μg/L in two of three shallow groundwater samples. There are very few targets associated with groundwater because Iola and the surrounding areas are dependent on surface water. Only ten private wells were identified within four miles of the site.

On-site contaminants were detected in sediment samples collected from intermittent drainage pathways on- and off-site. However, due to the distance from the site to the PPE, nine-tenths of a mile, and the flow rate of the Neosho River, 1,797 cfs, the effect on targets associated with surface water is expected to be minimal. The river is a fishery and is designated a critical habitat for a federally-listed threatened species. The closest water intake, the intake for the City of Humboldt, is 11.5 miles downstream of the PPE. The intake for Iola is upstream of the PPE.

Past and current sampling document a release of wastes related to smelting (i.e., cadmium, lead, and zinc) to the on-site soils. Zinc and all the impurities associated with zinc ore have been detected at elevated levels in on-site soils. There is a trailer home within 200 feet of the site and 16 workers on-site which could be affected by the soil contamination. The site is in an industrial area, thus the nearby population is limited.

Finally, although a release of cadmium, lead, or zinc to the air has not been documented, further disturbance of the soil could cause a release of particulates to the air. There are 8,608 people within four miles of the site, including the 16 workers and three residents within 200 feet of the site. There are also three potential sensitive environment targets.

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18. Lock, Chris, City of Iola Water Superintendent, February 25, 1993, telephone conversation with Leslie Scally, Jacobs Engineering Group Inc.

19. Dare, Craig, U.S. Geological Survey, July 13, 1993, telephone conversation with Leslie Scally, Jacobs Engineering Group Inc.

20. Ysusi, Albert, City of Humboldt Water Department, supervisor, December 23, 1992, telephone conversation with Leslie Scally, Jacobs Engineering Group Inc.

21. Adams, Steven, Aquatic Ecologist, Environmental Services Section, State of Kansas Department of Wildlife and Parks, January 15, 1993, letter to Leslie Scally, Jacobs Engineering Group Inc.

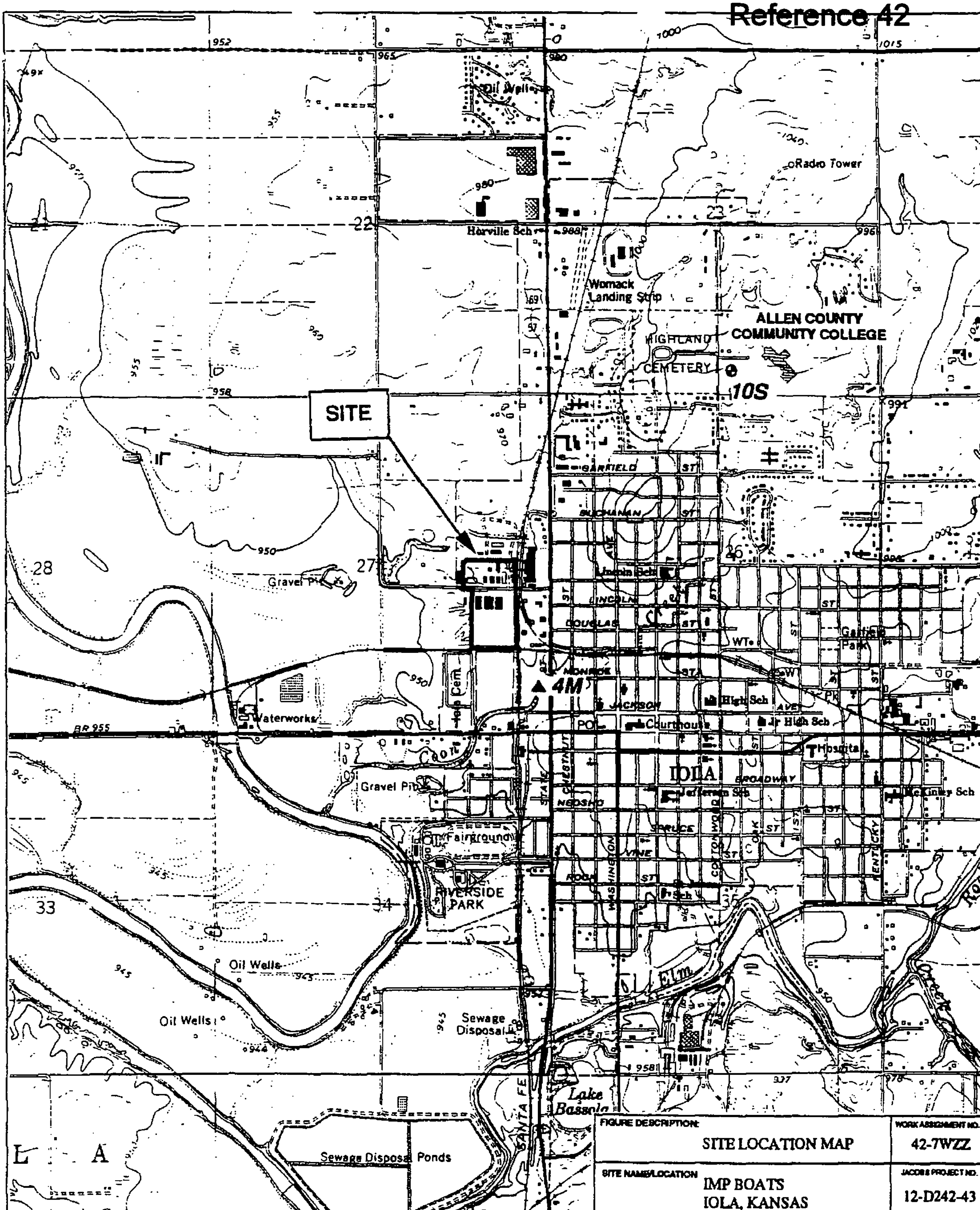
22. Gill, William, State Supervisor, U.S. Department of the Interior, Fish and Wildlife Service, December 22, 1992, letter to Leslie Scally, Jacobs Engineering Group Inc.

23. U.S. Department of Agriculture, Soil Conservation Service, November 1978, Soil Survey of Allen County, Kansas.

24. U.S. Environmental Protection Agency, Geographical Exposure Modeling System for the IMP Boats site, Iola, Allen County, Kansas.

25. Schell, Joe, February 25, 1993, telephone conversation with Leslie Scally, Jacobs Engineering Group Inc.

FIGURES

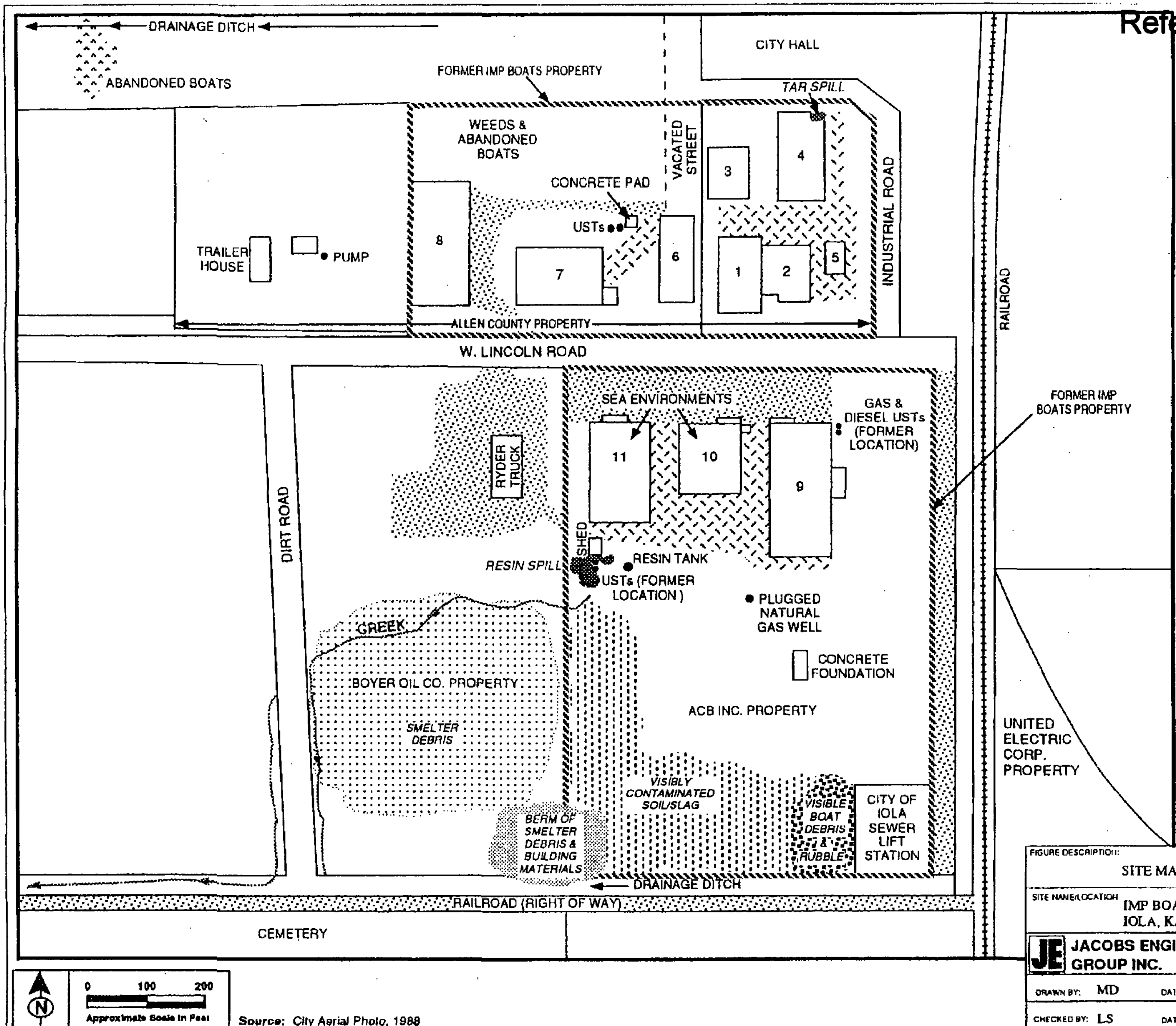


10S = THE LOCATION OF THE BACKGROUND SOIL SAMPLE
4M = THE LOCATION OF THE BACKGROUND SEDIMENT SAMPLES

0 .5 1
Approximate Scale in Miles

FIGURE DESCRIPTION: SITE LOCATION MAP	WORK ASSIGNMENT NO. 42-7WZZ
SITE NAME/LOCATION: IMP BOATS IOLA, KANSAS	JACOBS PROJECT NO. 12-D242-43
JE JACOBS ENGINEERING GROUP INC.	ARCS
DRAWN BY: MD DATE: 12/01/92	FIGURE NO.
CHECKED BY: LS DATE: 12/01/92	1

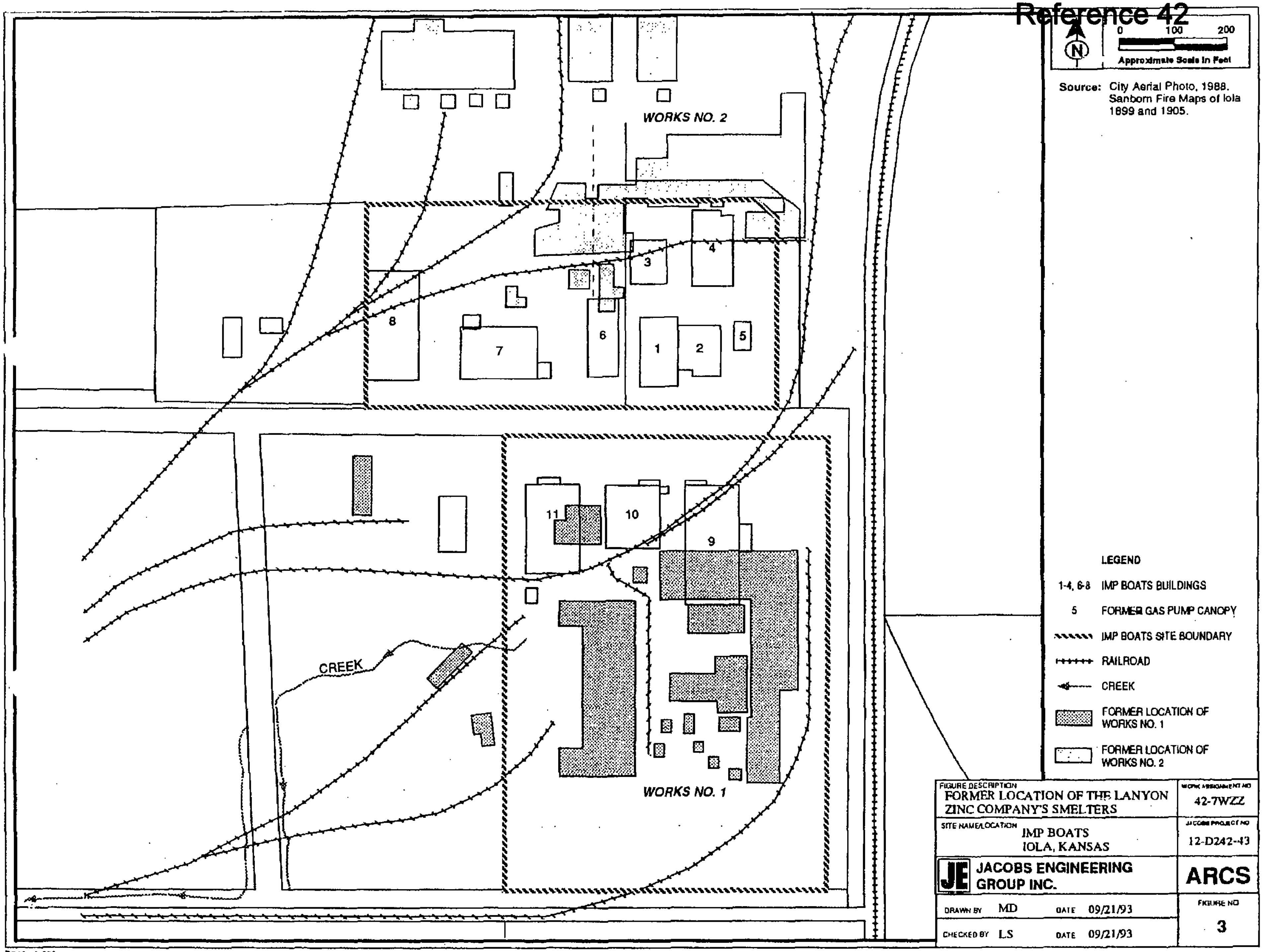
D242-43-001



Source: City Aerial Photo, 1988

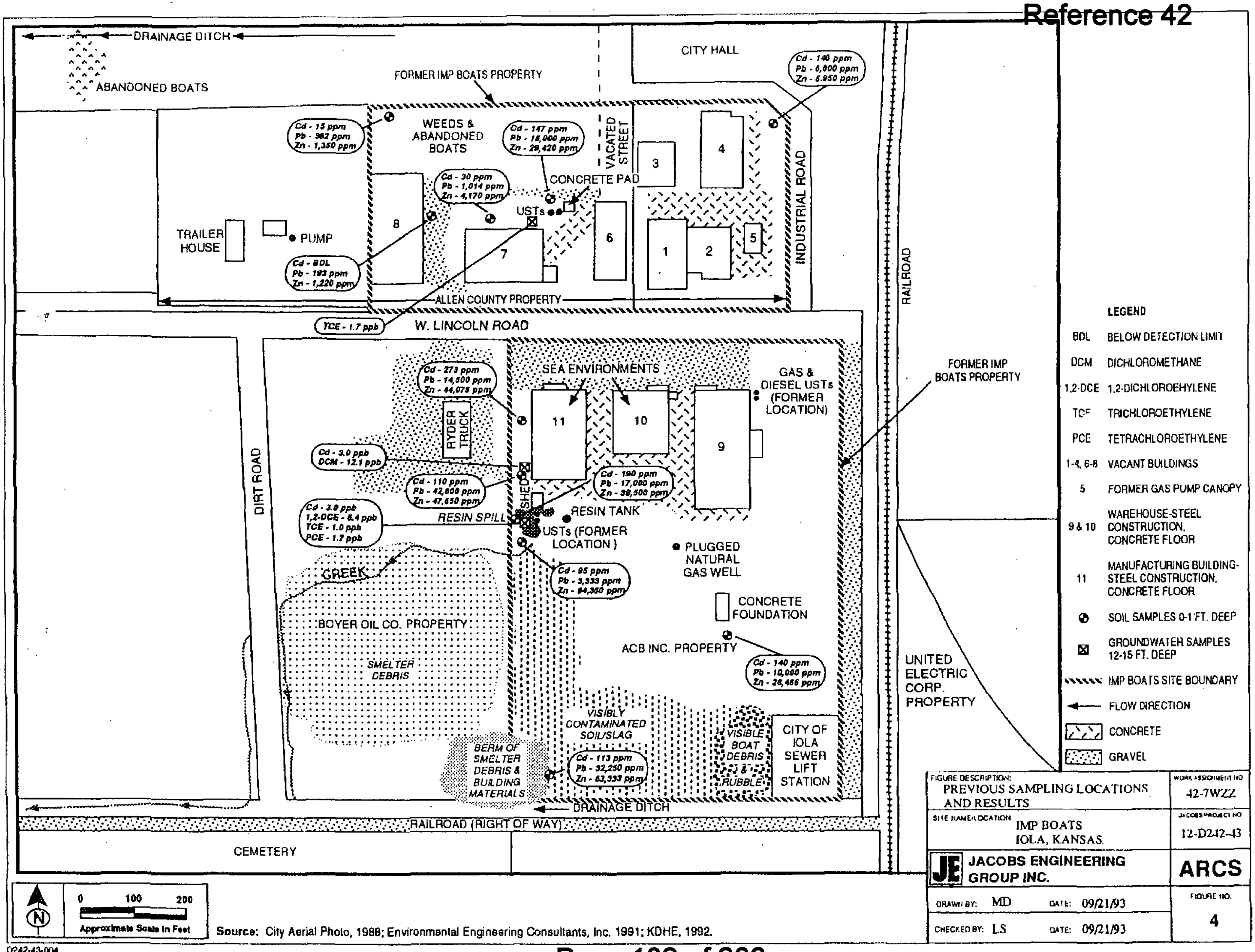
FIGURE DESCRIPTION: SITE MAP	WORK ASSIGNMENT NO. 42-7WZZ
SITE NAME/LOCATION: IMP BOATS IOLA, KANSAS	JACOBS PROJECT NO. 12-D242-43
JACOBS ENGINEERING GROUP INC.	ARCS
DRAWN BY: MD DATE: 09/21/93	FIGURE NO. 2
CHECKED BY: LS DATE: 09/21/93	

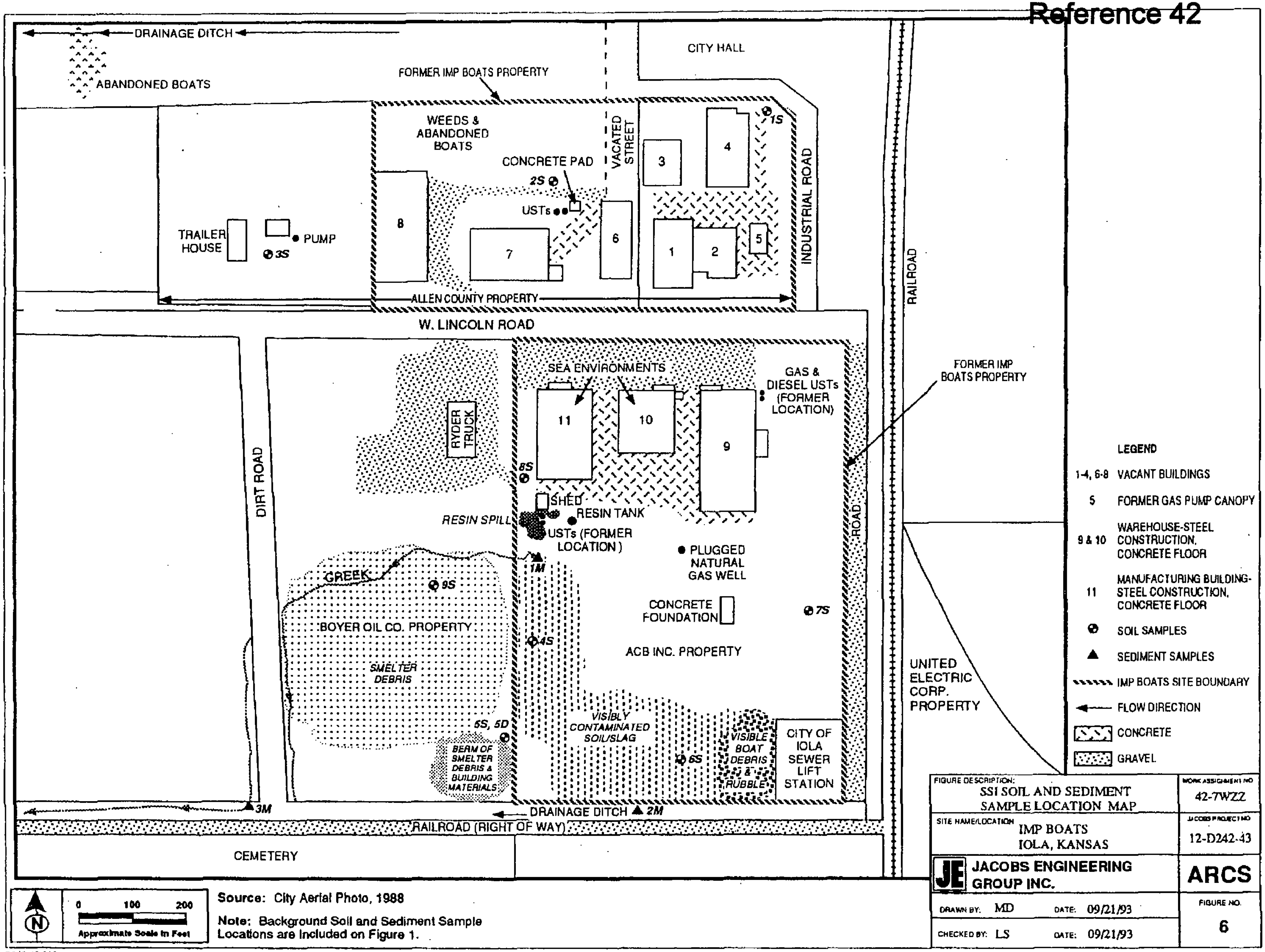
D242-43-002



0 100 200
Approximate Scale In Feet
N
Source: City Aerial Photo, 1988. Sanborn Fire Maps of Iola 1899 and 1905.
WORKS NO. 2
WORKS NO. 1
CREEK
1
2
3
4
5
6
7
8
9
10
11
LEGEND
1-4, 6-8 IMP BOATS BUILDINGS
5 FORMER GAS PUMP CANOPY
IMP BOATS SITE BOUNDARY
RAILROAD
CREEK
FORMER LOCATION OF WORKS NO. 1
FORMER LOCATION OF WORKS NO. 2
FIGURE DESCRIPTION
FORMER LOCATION OF THE LANYON ZINC COMPANY'S SMELTERS
WORK ASSIGNMENT NO
42-7WZZ
SITE NAME/LOCATION
IMP BOATS
IOLA, KANSAS
JACOBS PROJECT NO
12-D242-43
JE
JACOBS ENGINEERING GROUP INC.
ARCS
DRAWN BY MD
DATE 09/21/93
CHECKED BY LS
DATE 09/21/93
FIGURE NO
3

D242-43-003


DRAINAGE DITCH
ABANDONED BOATS
FORMER IMP BOATS PROPERTY
CITY HALL
Cd - 140 ppm
Pb - 6,000 ppm
Zn - 6,950 ppm
Cd - 15 ppm
Pb - 382 ppm
Zn - 1,350 ppm
WEEDS & ABANDONED BOATS
Cd - 147 ppm
Pb - 18,000 ppm
Zn - 29,420 ppm
VACATED STREET
Cd - 30 ppm
Pb - 1,014 ppm
Zn - 4,170 ppm
CONCRETE PAD
USTs
TRAILER HOUSE
PUMP
Cd - BDL
Pb - 193 ppm
Zn - 1,220 ppm
INDUSTRIAL ROAD
ALLEN COUNTY PROPERTY
RAILROAD
TCE - 1.7 ppb
W. LINCOLN ROAD
Cd - 273 ppm
Pb - 14,500 ppm
Zn - 44,075 ppm
SEA ENVIRONMENTS
GAS & DIESEL USTs (FORMER LOCATION)
FORMER IMP BOATS PROPERTY
RYDER TRUCK
Cd - 3.0 ppb
DCM - 12.1 ppb
Cd - 110 ppm
Pb - 42,800 ppm
Zn - 47,650 ppm
Cd - 190 ppm
Pb - 17,000 ppm
Zn - 38,500 ppm
SHED
DIRT ROAD
Cd - 3.0 ppb
1,2-DCE - 8.4 ppb
TCE - 1.0 ppb
PCE - 1.7 ppb
RESIN SPILL
RESIN TANK
USTs (FORMER LOCATION)
PLUGGED NATURAL GAS WELL
CREEK
Cd - 95 ppm
Pb - 3,333 ppm
Zn - 84,350 ppm
CONCRETE FOUNDATION
BOYER OIL CO. PROPERTY
ACB INC. PROPERTY
Cd - 140 ppm
Pb - 10,000 ppm
Zn - 28,486 ppm
UNITED ELECTRIC CORP. PROPERTY
SMELTER DEBRIS
VISIBLY CONTAMINATED SOIL/SLAG
BERM OF SMELTER DEBRIS & BUILDING MATERIALS
Cd - 113 ppm
Pb - 32,250 ppm
Zn - 63,333 ppm
VISIBLE BOAT DEBRIS & RUBBLE
CITY OF IOLA SEWER LIFT STATION
DRAINAGE DITCH
RAILROAD (RIGHT OF WAY)
CEMETERY
LEGEND
BDL BELOW DETECTION LIMIT
DCM DICHLOROMETHANE
1,2-DCE 1,2-DICHLOROEHYLENE
TCE TRICHLOROETHYLENE
PCE TETRACHLOROETHYLENE
1-4, 6-8 VACANT BUILDINGS
5 FORMER GAS PUMP CANOPY
9 & 10 WAREHOUSE-STEEL CONSTRUCTION, CONCRETE FLOOR
11 MANUFACTURING BUILDING-STEEL CONSTRUCTION, CONCRETE FLOOR
SOIL SAMPLES 0-1 FT. DEEP
GROUNDWATER SAMPLES 12-15 FT. DEEP
IMP BOATS SITE BOUNDARY
FLOW DIRECTION
CONCRETE
GRAVEL
N
0 100 200
Approximate Scale in Feet
Source: City Aerial Photo, 1988; Environmental Engineering Consultants, Inc. 1991; KDHE, 1992.
FIGURE DESCRIPTION: PREVIOUS SAMPLING LOCATIONS AND RESULTS
WORK ASSIGNMENT NO 42-7WZZ
SITE NAME/LOCATION IMP BOATS IOLA, KANSAS
JACOBS PROJECT NO 12-D242-43
JACOBS ENGINEERING GROUP INC.
ARCS
DRAWN BY: MD DATE: 09/21/93
CHECKED BY: LS DATE: 09/21/93
FIGURE NO. 4
D242-43-004



Source: City Aerial Photo, 1988

Note: Background Soil and Sediment Sample Locations are included on Figure 1.

FIGURE DESCRIPTION: SSI SOIL AND SEDIMENT SAMPLE LOCATION MAP	WORK ASSIGNMENT NO. 42-7WZZ
SITE NAME/LOCATION: IMP BOATS IOLA, KANSAS	JACOBS PROJECT NO. 12-D242-43
JACOBS ENGINEERING GROUP INC.	ARCS
DRAWN BY: MD DATE: 09/21/93	FIGURE NO. 6
CHECKED BY: LS DATE: 09/21/93	

D242-43-005

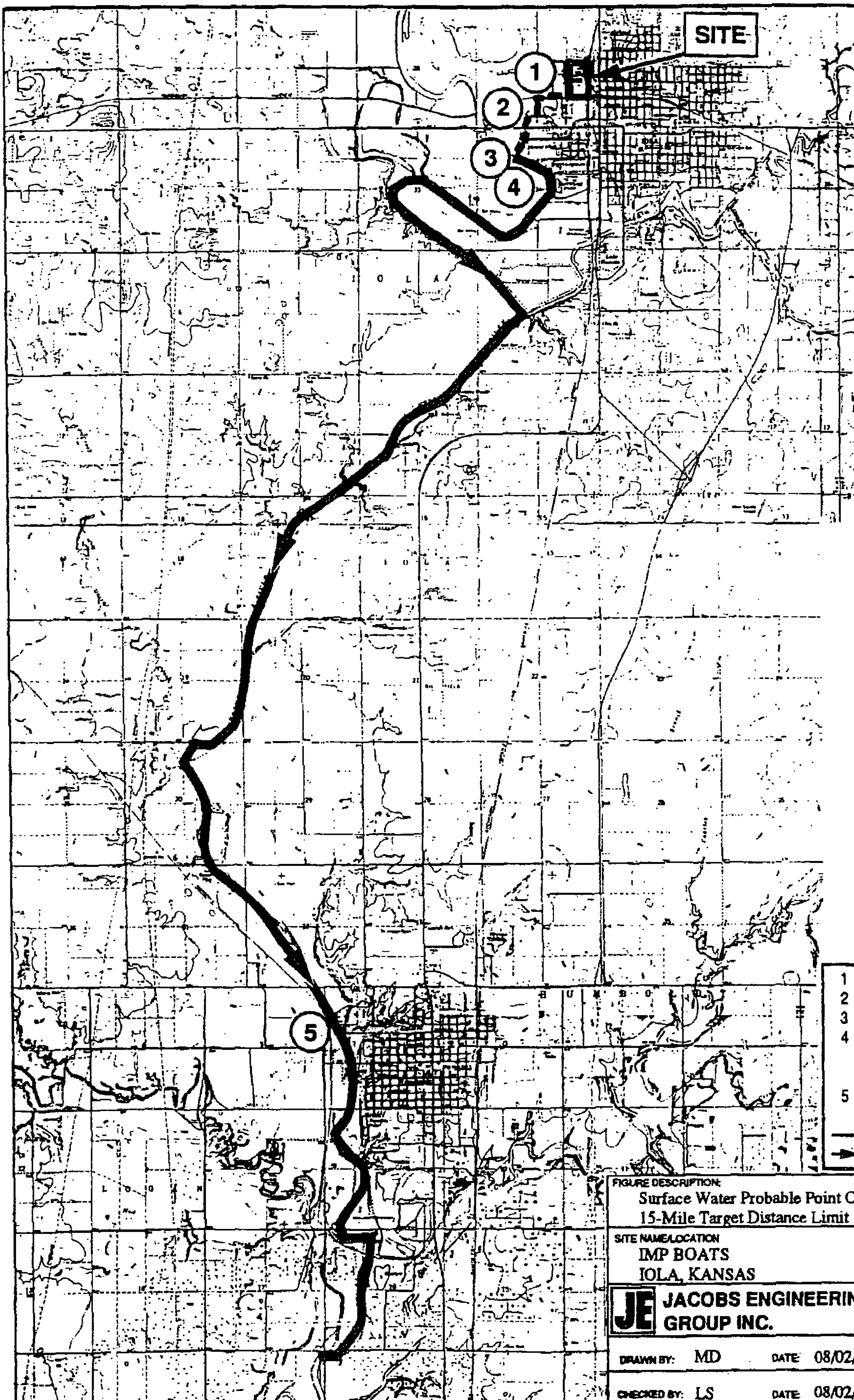


FIGURE DESCRIPTION: Surface Water Probable Point Of Entry/ 15-Mile Target Distance Limit	WORK ASSIGNMENT NO 42-7WZZ
SITE NAME/LOCATION IMP BOATS IOLA, KANSAS	JACOBS PROJECT NO 12-D242-43
JACOBS ENGINEERING GROUP INC.	ARCS
DRAWN BY: MD DATE: 08/02/93	FIGURE NO. 5
CHECKED BY: LS DATE: 08/02/93	

D842-43-15MILE

TABLES

TABLE 2
IMP BOATS SCREENING SITE INSPECTION
IOLA, KANSAS
CERCLIS NO. KSD091356857
CONCENTRATIONS (mg/kg) OF TOTAL METALS DETECTED IN SOIL AND SEDIMENT SAMPLES
EPA SAMPLE ACTIVITY NO. CSXKY
APRIL 1993

Sample Location	1S	2S	3S	4S	5S	5D	6S	7S	8S	9S	10S*	1M	2M	3M	4M**
EPA Sample ID No.	002	012	003	014	015	015D	013	004	005	006	011	007	008	009	010
Contaminants															
Aluminum	7,130	4,780	912	3,970	3,950	3,920	4,720	1,030	5,250	5,730	10,300	8,020	5,760	8,840	1,300
Antimony	1.00 U	1.09	21.1	37.5	2.00 U	2.00 U	72.7	1.00 U	22.6	21.6	1.00 U	1.00 U	2.39	1.00 U	1.00 U
Arsenic	101	11.7	189	820	175	263	391	325	356	476	10.0 U	56.6	261	43.2	10.0 U
Barium	396	73.6	124	123	327	307	315	20.3	143	242	132	215	281	143	53.4
Beryllium	0.580	0.370	0.530	1.00 U	0.800	3.87	0.620	1.11	1.21	0.970	0.910	0.830	0.900	0.890	0.130
Cadmium	80.8	28.3	272	53.5	45.8	49.8	115	4.96	63.3	70.8	2.17	60	296	78.9	1.99
Calcium	31,900	138,000	10,300	3,700	3,310	3,390	6,000	2,570	3,390	3,090	5,980	5,080	4,040	29,700	12,800
Chromium	13.3	13.1	10.5	8.27	11.1	11.3	11.7	5.26	8.76	20.6	15.8	15.4	12.7	13.3	4.12
Cobalt	15.3	11.6	27.1	19.7	30.5	29.2	15.7	0.900	8.81	14.9	9.85	12.3	16.2	14.0	5.80
Copper	1,000	103	7.81	1,900	1,520	1,360	757	9.48	721	466	17.4	500	1,380	276	8.44
Iron	30,400	10,900	4,080	31,900	63,100	54,400	22,100	3,750	25,100	21,200	13,300	16,100	41,900	26,000	6,730
Lead	6,610	859	543	8,270	8,340	8,290	12,900	5,730	2,390	23,800	67.8	3,000	7,640	2,960	77.8
Magnesium	2,460	6,580	884	1,810	1,030	1,390	661	2,550	439	809	2,190	1,340	872	2,630	5,090
Manganese	1,520	473	169	1,280	8,570	8,480	940	162	876	2,500	453	893	1,970	872	579
Nickel	16.6	9.33	23.3	35.8	50.1	52.9	32.3	2.21	22.7	44.3	10.8	26.8	33.1	23.8	4.50
Potassium	658	470	332	400 U	357	362	124	189	148	195	1,630	701	363	998	215
Selenium	11.8	10.0 U	10.0 U	100 U	28.5	27.9	21.6	13.3	10.9	20.8	10.0 U	12.7	25.3	16.8	10.0 U
Silver	21.8	3.80	21.8	43.3	35.2	28.9	41.8	0.980	17.7	42.7	0.440	14.8	18.4	7.63	0.550
Sodium	126	101	113	400 U	109	108	114	111	105	145	129	96.9	108	290	125

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TABLE 1
IMP BOATS SCREENING SITE INSPECTION
IOLA, KANSAS
CERCLIS NO. KSD091356857
RATIONALE FOR SOIL AND SEDIMENT SAMPLE LOCATIONS AND ASSOCIATED ANALYSES
EPA SAMPLE ACTIVITY NO. CSXKY

Sample Location	EPA Sample ID No.	Location	Rationale	Selected Analyses			
				% Solids	Total Metals	TCLP	Semi-VOCs
1S	CSXKY-002	NE Corner of the Allen County Property	Former Location of Smelting Facilities	X	X		
2S	CSXKY-012	Behind Building 7	Former Location of Smelting Facilities	X	X	X	
3S	CSXKY-003	Approximately 150' East of the Trailer	Possible Area of Waste Deposition, Location of Resident Population	X	X		
4S	CSXKY-014	Western Edge of the ACB Property	Area of Visible Waste Deposition, Boat Burn Area	X	X	X	X
5S	CSXKY-015	Southeast Corner of the Boyer Property	Area of Visible Waste Deposition, Near Boat Burn Area	X	X	X	X
5D	CSXKY-015D	Southeast Corner of the Boyer Property	Quality Assurance Duplicate Sample	X	X	X	X
6S	CSXKY-013	Southern Edge of the ACB Property, Boat Debris and Rubble Pile	Area of Visible Waste Deposition	X	X	X	
7S	CSXKY-004	ACB Eastern Property Line	Possible Area of Waste Deposition	X	X		
8S	CSXKY-005	Southwest Corner of Building 11	Confirmation of Previous Sample	X	X		
9S	CSXKY-006	Area of Smelter Debris, Boyer Property	Area of Visible Waste Deposition	X	X		
10S	CSXKY-011	Allen County Community College	Off-site Background Soil Sample	X	X		X
1M	CSXKY-007	ACB Western Property Line, Drainage Area	Beginning of Surface Water Migration Pathway	X	X		
2M	CSXKY-008	ACB Southern Property Line, Drainage Area	Beginning of Surface Water Migration Pathway	X	X		
3M	CSXKY-009	Drainage Ditch, Southwest of the Boyer Oil Company Property	Surface Water Migration Pathway, Confluence of Samples 1M and 2M,	X	X		
4M	CSXKY-010	Coon Creek, West of Highway 169	Off-site Background Sediment Sample	X	X		
RB	CSXKY-001	Soil Rinsate	Soil Sampling Equipment Rinsate		X		X

S-Surface Soil Sample
M-Sediment Sample
D-Duplicate
RB-Rinsate Sample

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9/22/93

TABLE 3
IMP BOATS SCREENING SITE INSPECTION
IOLA, KANSAS
CERCLIS NO. KSD091356857
CONCENTRATIONS (mg/L) OF METALS DETECTED IN SOIL SAMPLES USING THE TCLP
EPA SAMPLE ACTIVITY NO. CSXKY

Sample ID No.	2S	4S	5S	5D	6S	TCLP Limits*
EPA ID No.	012	014	015	015D	013	
Contaminant						
Arsenic	0.050 U	0.050 U	0.050 U	0.050 U	0.050 U	5.0
Barium	0.849	0.548	1.38	1.35	0.489	100.0
Cadmium	0.138	0.670	0.203	0.196	1.05	1.0
Chromium	0.010 U	0.010 U	0.010 U	0.010 U	0.026	5.0
Lead	0.168 U	85.2	34.6	32.2	80.1	5.0
Selenium	0.050 U	0.180	0.050 U	0.050 U	0.050 U	1.0
Silver	0.010 U	0.011	0.011	0.012	0.010 U	5.0

U = actual value of sample is less than the measurement detection limit

Shaded data indicate concentrations greater than the TCLP limits

* Maximum concentration of contaminants for the toxicity characteristic

Sample locations are shown on Figure 6

TABLE 2 (continued)
IMP BOATS SCREENING SITE INSPECTION
IOLA, KANSAS
CERCLIS NO. KSD091356857
CONCENTRATIONS (mg/kg) OF TOTAL METALS DETECTED IN SOIL AND SEDIMENT SAMPLES
EPA SAMPLE ACTIVITY NO. CSXKY
APRIL 1993

Sample Location	1S	2S	3S	4S	5S	5D	6S	7S	8S	9S	10S*	1M	2M	3M	4M**
EPA Sample ID No.	002	012	003	014	015	015D	013	004	005	006	011	007	008	009	010
Contaminants															
Thallium	6.00 U	6.00 U	6.00 U	60.0 U	12.0 U	12.0 U	6.00 U	6.00 U	6.00 U	6.00 U	6.00 U	6.00 U	6.00 U	6.00 U	6.00 U
Vanadium	22.2	12.0	17.4	16.5	26.6	24.8	39.1	3.50	28.4	44.2	32.3	21.1	28.4	27.0	7.99
Zinc	13,100	3,390	753	15,100	10,500	12,200	12,900	18,800	13,500	27,300	228	14,100	22,400	9,060	216
% Solids	77	74.4	91.6	80.9	83.3	84.3	72.9	87	84.2	76.8	71.7	67.9	74.8	39.4	88.2

U = actual value of sample is less than the measurement detection limit
* 10S = background soil sample
** 4M = background sediment sample
Sample locations are shown in Figures 1 and 6

Shaded data indicate contaminants of concern which were detected at concentrations clearly greater than those detected in background samples

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9/22/93

PRELIMINARY ASSESSMENT

IMP BOATS, INC. SITE
IOLA, KANSAS

EPA Identification Number
KSD091356857

Kansas Department of Health and Environment
Bureau of Environmental Remediation
Pre-Remedial Section

January, 1992

Preliminary Assessment

Completed by:
Danny C. Cooper, Environmental Technician

Assisted by:
Jim Alldritt, Geologist
Kurt Limesand, Geologist

Edited by;
Phil Koontz, Section Chief, Pre-Remedial Section

Secretarial assistance and reproduction by:
Betty O'Neill, Office Assistant

Final Review by:
Larry Knoche, Director, Bureau of Environmental Remediation

Field Work Completed By:

Kansas Department of Health and Environment

Danny C. Cooper, Environmental Technician and Team Leader
Jim Alldritt, Geologist

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SECTION 1: INTRODUCTION

The Kansas Department of Health and Environment (KDHE) has entered into a cooperative agreement with the Environmental Protection Agency (EPA) under which the KDHE will perform Preliminary Assessments (PAs) to determine if there are wastes at various sites in Kansas that pose an immediate or potential threat to human health and the environment. These investigations are conducted in agreement with the requirements of the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA) as amended by the Superfund Amendments and Reauthorization Act of 1986 (SARA), collectively known as "Superfund."

The IMP Boats Inc. Site has CERCLIS identification number KSD091356857, and is located at 500 West Lincoln Road in the city of Iola, Allen County, Kansas. The purpose of this PA is to collect information to support a decision regarding the need for further action under CERCLA/SARA.

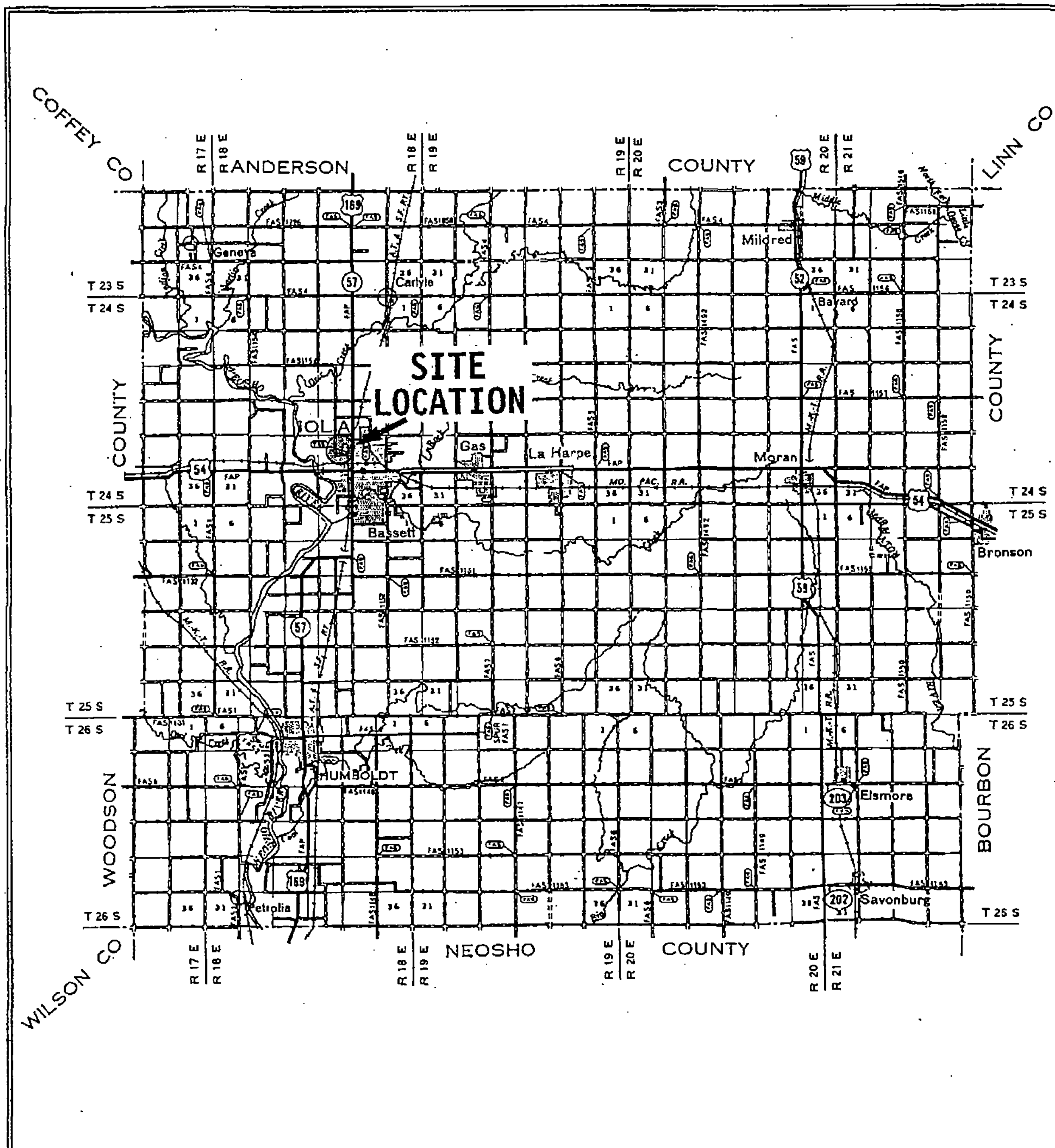
The scope of this PA involved the research and review of file information and historical data, a comprehensive target survey, on-site sampling and reconnaissance (November 12, 1991), tabulation of analytical data and a limited research into the ownership and operational history of the site.

SECTION 2: SITE DESCRIPTION, OPERATIONAL HISTORY, AND WASTE CHARACTERISTICS

2.1: Site Location

The IMP Boats, Inc. Site is located at 500 West Lincoln Road in an industrial area at the west edge of Iola, Allen County, Kansas (Figure 1). Its geographic coordinates are 37° 55' 38" N latitude and 95° 24' 46" W longitude (Reference 1; Reference 2). The site is approximately 2 blocks west of US Highway 169, just west of the Atchison, Topeka & Santa Fe Railroad tracks, on both the north and south side of West Lincoln Road (Figure 2). The total area owned by IMP Boats, Inc. is approximately 130 acres (Reference 3).

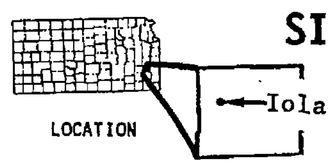
The climate of Allen County is typical continental with large diurnal and annual variations in temperature. In winter, the average temperature is 56.6 degrees Fahrenheit and the average daily minimum is 45.5 degrees. In summer, the average temperature is 77.4 degrees and the average daily maximum is 88.3 degrees. The highest temperature recorded was 115° and the lowest was -20°. The mean annual precipitation is 35.58" while the mean annual net precipitation is -13.42" (Reference 4; Reference 5, pp. 52, 63).



- N -

1 INCH = 4.4 MILE
SCALE

ALLEN COUNTY



LOCATION

FIGURE 1
SITE LOCATION MAP

SOURCE: STATE HIGHWAY COMMISSION OF KS. DEPT. OF P & D, 1969

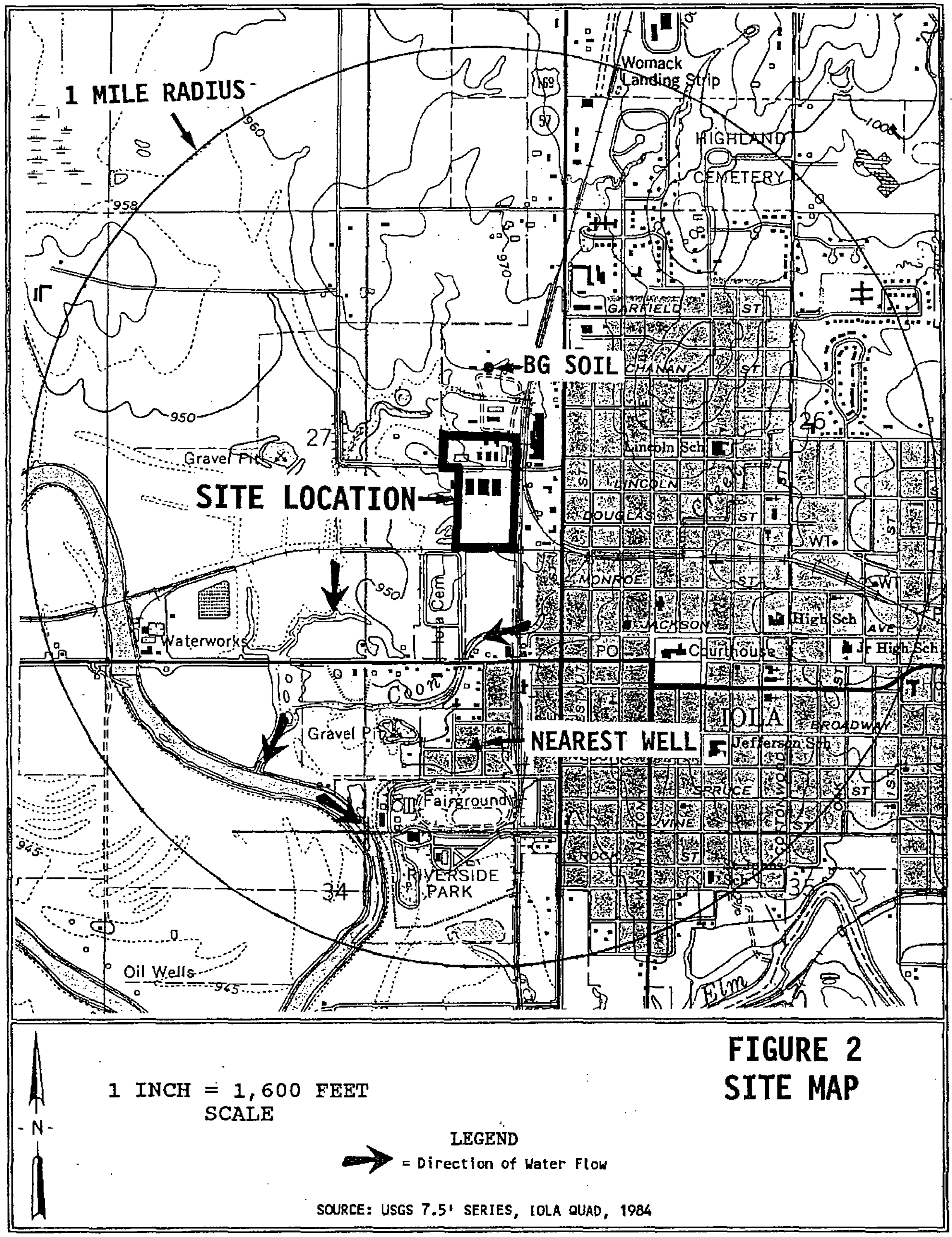


FIGURE 2
SITE MAP

SOURCE: USGS 7.5' SERIES, IOLA QUAD, 1984

PRELIMINARY ASSESSMENT OF THE IMP BOATS SITE
DECEMBER 1991

2.2: Site Description

The IMP Boat property is located on relatively flat terrain (Zaar silty clay, 1 to 3 percent slopes) that slopes gently toward the southwest in the direction of the Neosho river, which is located about a mile from the site (Reference 4). There are several abandoned boat carcasses, six underground storage tanks, ten buildings, at least one abandoned and unplugged gas well, several abandoned drums, various refuse and smelter waste piles on site (Reference 6, Figure 3).

2.3: Operational History and Waste Characteristics

In 1896 the first zinc smelter in Kansas was built, on what is now IMP Boat property, by Robert Lanyon's sons. The Lanyon Zinc Company was formed in 1899, with two of its three smelters located on this property, and became the largest zinc smelter in the United States and the second largest in the world. They had a capacity to produce 150 tons of spelter and 12 tons of sheet zinc per day. This site was operated as a smelter for several years under various ownerships. The foundations of the original plants are visible in a 1962 aerial photograph (Reference 7).

IMP Boats operated on this site for a number of years, constructing fiberglass boats, with Herbert Morris as plant manager and John Maier as production manager. Sea Environmental is now using these same facilities for the same purpose, under the same management. Resource Conservation and Recovery Act (RCRA) regulated wastes used in this operation are acetone, still bottoms, gel coat and resin. There are currently six underground storage tanks on site which contained acetone, gasoline and diesel. These tanks are reportedly no longer in use and need to be brought into compliance with state underground tank requirements (Reference 6 and 8).

The primary contaminants of concern on site are cadmium and lead. Cadmium and lead have been detected in soils at concentration of 273 and 42,800 parts per million (ppm), respectively. Further analysis of soils from the IMP Boats site revealed the presence of cadmium at twice its Toxicity Characteristic Leachate Procedure (TCLP) level and lead at 40 times its TCLP level (Attachment 1). Soils on site may therefore be considered hazardous according to toxicity standards established by EPA.

SECTION 3: GROUND WATER PATHWAY

3.1: Hydrologic Setting

Allen County occupies the Osage Plains region of the Central Lowlands physiographic province. Important surface features include the southward-trending Neosho River valley in the western

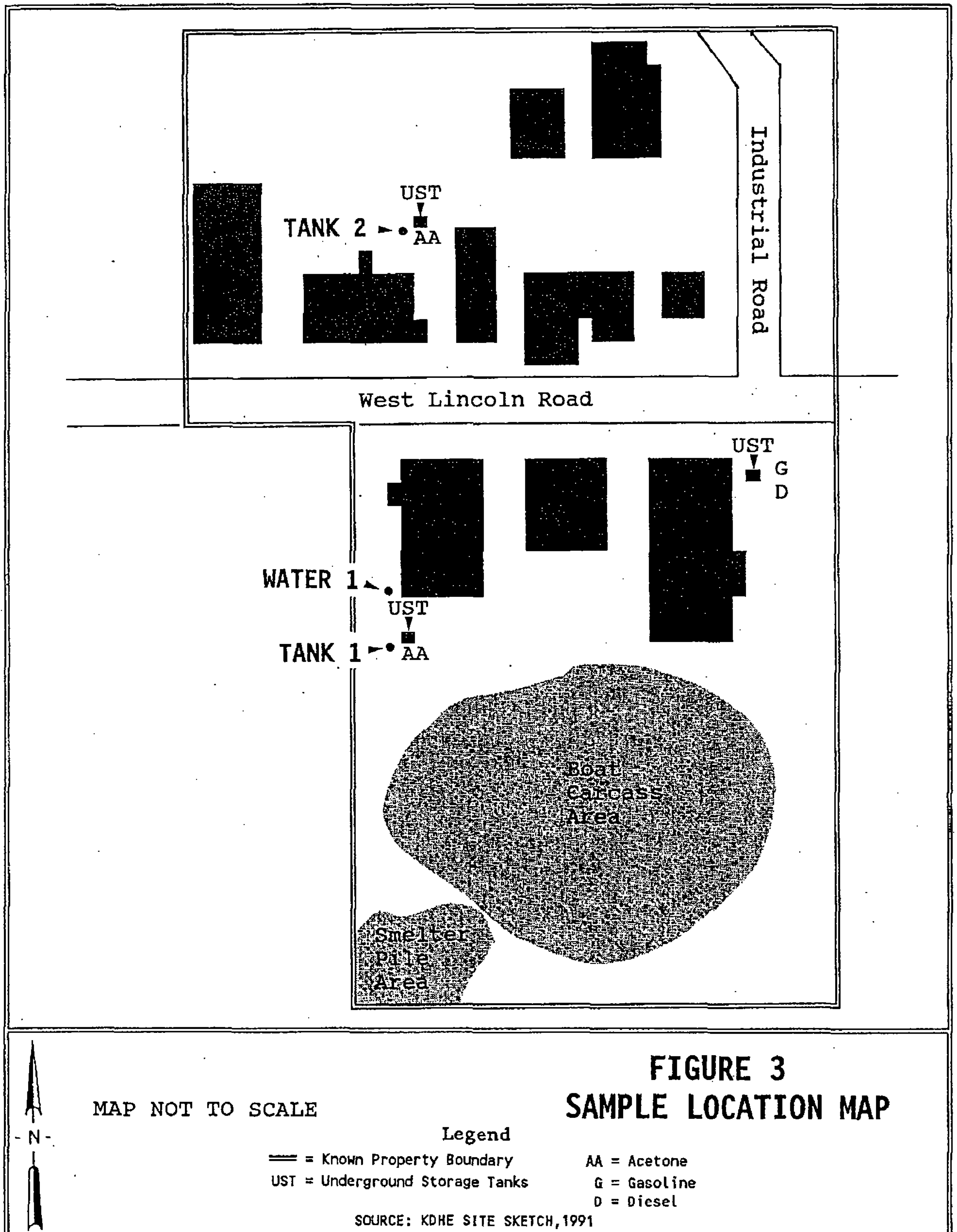


FIGURE 3
SAMPLE LOCATION MAP

SOURCE: KDHE SITE SKETCH, 1991

PRELIMINARY ASSESSMENT OF IMP BOATS SITE
DECEMBER 1991

portion of the county and the highland plains that have been eroded to reveal the sedimentary rocks of Pennsylvanian age that form outcrops throughout much of the county. These rocks have a regional dip to the northwest of approximately 13 feet per mile. The Little Osage and Marmaton Rivers drain the eastern quarter of the county toward neighboring Bourbon County (Reference 9).

Oil wells drilled to Precambrian basement in Allen County reportedly encountered schists and granites. These igneous and metamorphic rocks are overlain by sedimentary rocks of Paleozoic and Cenozoic age. The overall thickness of Paleozoic rocks in the region of Allen County is approximately 2000 feet. Pennsylvanian-aged rocks form the youngest strata in the Paleozoic sequence; these rocks are composed largely of interbedded limestone and shale units with rare intraformational sandstones. These units are generally relatively impermeable in the subsurface; however, weathering at or near the land surface can greatly increase the water-bearing capacity of the rocks. Shallow, weathered Pennsylvanian-aged rocks form important low-yield groundwater aquifers throughout Allen County (Reference 9).

The IMP Boat site lies on unconsolidated alluvial sediments of Quaternary age that have been deposited in the Neosho River valley. These deposits have an average thickness of 25 feet and generally yield good quantities of very hard water. An overlying silt layer in the valley forms a confining bed and contributes to artesian conditions in the aquifer throughout much of the valley. Illinoisian terrace deposits drape the upper heights of the floodplain and may also produce moderate amounts of potable groundwater. A private water well drilled in the SW 1/4, NE 1/4, NE 1/4 of Section 34, T 24 S, R 18 E (3/4 of a mile south of the IMP Boat site) logged five feet of soil, seven feet of yellow clay, eight feet of blue fissile clay, four feet of clayey silt and gravel, five feet of wet sand and gravel, two feet of saturated sand, and limestone from 31 to 56 feet. The well was screened in the sand and gravel and limestone and had a recorded static water level of eight feet below the land surface (Reference 8).

A risk assessment report prepared for the IMP Boat site by Environmental Engineering Consultants, Inc. of Stillwater indicated that the water table had been observed at 3.5 to 12.0 feet below ground surface across the site (Attachment 1). Groundwater flow is presumed to be toward the west-southwest, <u>i.e.</u> toward the regional groundwater discharge point, the Neosho River.

3.2: Ground Water Targets

Most of the population within a 4-mile radius relies on the City of Iola for their water supply. The Neosho river is the source for the city's public water supply (Reference 8).

There are 11 domestic wells within 4 miles of the site (Reference 8). At 2.84 persons per household (the average for Iola Township) (Reference 10), this equates to 31 residents. The nearest residence having a domestic well is approximately 2200 feet south of the southern site boundary (Figure 2).

3.3: Ground Water Conclusions

The analytical results (Attachment 2) for all groundwater samples (Table 1) collected during the PA show levels of cadmium, lead and selected volatile organic compounds (VOC's) to be below their respective Kansas Action Levels (KAL's) and thus within acceptable drinking water standards. Sample locations are depicted in Figure 3. Since the lead and cadmium in the soils have not reached groundwater in the last 90 years, contamination of groundwater by migration of lead or cadmium through the soil does not appear to be an immediate threat.

TABLE 1
Nov. 1991, Organic and Heavy Metal Analytical Data - Water
IMP Boats Site
Iola, Kansas
(units in ppb)

Sample ID	Cadmium	Lead	DCM	1,2-DCE	TCE	PCE
Water 1	3.0	<20.0	12.1	ND	ND	ND
Tank 1	3.0	<20.0	ND	6.4	1.0	1.7
Tank 2	<2.0	<20.0	ND	ND	1.7	ND
KAL	10.0	50.0	50.0	7.0	5.0	5.0

DCM = Dichloromethane
PCE = Tetrachloroethylene
TCE = Trichloroethylene
1,2-DCE = 1,2-Dichloroethylene
KAL = Kansas Action Level
ND = No Detect

SECTION 4: SURFACE WATER PATHWAY

4.1: Hydrologic Setting

The Neosho River and its tributaries drain almost all the county, with the exception of the eastern one-quarter. The Neosho River in Allen County has an average gradient of about 1.5 feet per mile (Kansas Water Resources Board, 1961). Surface drainage from the site flows approximately one half-mile southwest to the Neosho River.

4.2: Surface Water Targets

There is one drinking water intake located on the Neosho River within 15 miles downstream of the site. This is a municipal water supply that serves the city of Humboldt and also supplies water to two Rural Water Districts. Humboldt has a population of 2,178 (Reference 11) and the rural water districts serve 52 residences (Reference 12). Humboldt Township has 2.69 people per residence (Reference 10). Therefore the total population served by surface water within fifteen miles downstream is 2,318.

The City of Iola gets its drinking water from the Neosho River and sells water to eight rural water districts. Its surface water intake is approximately one-half mile upstream from the point where surface water run-off from the site eventually enters the Neosho. This indicates that there is no health threat to the Iola drinking water supply as a result of run-off from IMP Boats.

There are no wetlands identified within fifteen miles downstream. The Neosho River is used for irrigation of 1302 acres within this same distance (Reference 13). Figuring 1.5 people per acre irrigated gives a total of 1953 persons affected by surface water used in the food chain. The Neosho is also used for recreational fishing. Aquatic species commonly caught include white bass, spotted bass, flathead catfish, crappie, channel catfish, and bullhead (Reference 14). The Bald Eagle, Eastern Hognose Snake, Eastern Spotted Skunk, Flat Floater, Neosho Madtom, Northern Crawfish Frog, Peregrine Falcon, and Redspot Chub are known or likely to occur in Allen County. A critical habitat has been designated in Allen County for some of these and all of them are listed as threatened or endangered species (Reference 15).

4.3: Surface Water Conclusions

Surface soil grab samples taken at the site contained levels of lead from 193 ppm to 42,800 ppm and cadmium from below detection limit to 273 ppm (Attachment 1). These levels of soil contamination along with the TCLP level indicate a potential for migration of lead and cadmium off site with surface water runoff to the Neosho River. This, in turn, would create a potential for: (1) contamination of the Humboldt Public Water Supply, (2) contamination of the food chain from vegetation grown on lands irrigated with water from the Neosho, within fifteen miles downstream, (3) contamination of the food chain through fish taken from the Neosho and, (4) hazardous conditions for those threatened or endangered species in the area and critical habitats within fifteen miles downstream.

SECTION 5: SOIL EXPOSURE AND AIR PATHWAYS

5.1: Physical Conditions

The surface at the Site is covered primarily by gravel and smelter residue. It appears likely that when the smelter was leveled the residue, as well as the smelter waste piles, were spread over the entire site, with the greatest quantity of residue deposited on the southern half of the Site.

The background soil sample, taken north of the site at the location shown in Figure 2, contained cadmium and lead at 0.398 and 25.200 ppm, respectively (Attachment 2). These levels are well below those found in surface samples taken on site and present no known health hazards.

5.2: Soil and Air Targets

IMP Boats is located in an industrial park and employs nine people. The site is not fenced and is subject to local traffic both vehicle and pedestrian. The nearest residential area lies about 750 feet east of the site. The total population within a 4-mile radius of the site is approximately 2,750 as determined by a house count from USGS topographic maps in conjunction with References 10 and 11.

5.3: Soil Exposure and Air Pathway Conclusions

The magnitude of lead and cadmium detections in the surface soils on site (Attachment 1) suggests that a strong potential exists for airborne transport of contaminants beyond the site boundaries. Airborne transport of fine particles off-site presents a possible threat of exposure to humans, animals and plant life in the vicinity of the site and provides another conduit for the contaminants to reach surface water in the area. Agitation of the surface by human activities such as construction or lawn mowing greatly increases the likelihood that workers or incidental pedestrians will receive acute exposures to the metals known to reside on site. A direct contact threat exists for any persons who may work on or trespass through the property.

SECTION 6: WASTE EXPOSURE SYMPTOMS

Chronic overexposure to cadmium through ingestion and/or inhalation may cause irreversible lung damage, kidney disease, and affect other organs, prostate and blood. It is considered to be a probable human carcinogen (Attachment 3).

Chronic overexposure to lead may cause anemia, kidney damage, impaired eyesight, lead build-up in the central nervous system and blood. It is considered to be a probable human carcinogen (Attachment 3).

SECTION 7: CONCLUSIONS AND RECOMMENDATIONS

7.1: Conclusions

Soil at the IMP Boats Site is contaminated with heavy metals. This is a result of the previous operation of a zinc smelter on what is now IMP Boats, Inc. property. Levels of cadmium and lead have been found in excess of state soil clean-up guidelines and Federal TCLP standards, thus qualifying it as Hazardous Waste.

Under Superfund, the owner of contaminated property can be named as a potentially responsible party (PRP). The PRP can be held liable for determining the extent and degree of contamination and eventual remediation.

There are six underground storage tanks on site that have been registered with the state. These tanks are not currently in compliance with state regulations. One known open gas well exists on site.

7.2: Recommendations

Recommendations for the IMP Boats, Inc. Site are as follows:

1. Access to areas of surface contamination should be restricted.

2. The owner of the IMP Boats, Inc. (a defunct corp.) property should be identified and advised of the KDHE findings from this Preliminary Assessment.

3. The owner of the site should be informed of existing petroleum storage tank regulations. The owner should bring the underground storage tanks on site into compliance with State regulations or have the tanks removed. This work must be approved by the KDHE prior to implementation.

4. The owner of the site should plug all abandoned wells on site following State guidelines and required supervision.

5. The potential responsible parties when identified, should be informed of the presence of contamination at the site, and formal agreements must be made with the KDHE to complete the appropriate corrective actions at the site.

6. If recommendation 5. is not complied with then the KDHE should, under the auspices of Superfund, (a) initiate a Screening Site Inspection (SSI) to determine the extent of hazardous contamination and (b) determine what action is required to remediate these hazardous areas.

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10. The United States Department of Commerce, Household, Family, and Group Quarters Characteristics: 1990.

11. Bureau of the Census, Department of Commerce, Kansas 1990 Census Population Counts.

12. Conversation with Lewis Dillow (RWD # 10) and Ron Bumstead (RWD # 9), January 15, 1992.

13. Kansas Board of Agriculture, Water Use Records.

14. Kansas Department of Wildlife and Parks, Fishing Guide to Kansas.

15. Kansas Department of Wildlife and Parks, Threatened and Endangered Species.

ATTACHMENT 1

ENVIRONMENTAL RISK ASSESSMENT

PHASE II

ENVIRONMENTAL RISK ASSESSMENT

FOR THE EVALUATION OF POTENTIALLY HAZARDOUS MATERIALS

IMP BOATS, INC.
IOLA, KANSAS

FINAL REPORT

RECEIVED

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REMEDIATION

ENVIRONMENTAL
ENGINEERING
CONSULTANTS, INC.

2323 W. 7TH PLACE
STILLWATER, OK 74074
405-377-5558

PHASE II

ENVIRONMENTAL RISK ASSESSMENT

FOR THE EVALUATION OF POTENTIALLY HAZARDOUS MATERIALS

IMP BOATS, INC. IOLA, KANSAS

FINAL REPORT

PREPARED FOR

IOLA BANK AND TRUST
IOLA, KANSAS

PREPARED BY

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APRIL 1991

PHASE II ENVIRONMENTAL RISK ASSESSMENT
IMP BOATS INC. - IOLA, KANSAS
FINAL REPORT

INTRODUCTION

A Phase I Environmental Risk Assessment was performed on the property currently occupied by IMP Boats, Inc. in Iola, Kansas by Environmental Engineering Consultants, Inc. on November 9, 1990. The objective of the Phase I Risk Assessment was to document the environmental condition of the property and the adjacent area during an inspection of the site. A detailed report was submitted.

A Phase I Environmental Risk Assessment is a qualitative assessment of the property. A Phase II Environmental Risk Assessment is performed if "red flags" are disclosed during the Phase I investigation. The Phase I Environmental Risk Assessment discovered several findings (red flags) that suggested that a Phase II Risk Assessment was needed. These findings included:

- o The property was once the site of a smelter. It is believed that brick firing and zinc smeltering took place on the property. A large area of waste smelter material located in the southwestern corner of the property became part of the concern and therefore needed further study.

- o The IMP BOAT property has six (6) underground storage tanks located on the premises. All of these tanks are between the ages of 17 and 29 years. No monitoring for leak detection has been performed for these tanks. Acetone, gasoline, and diesel were reportedly stored in these tanks.

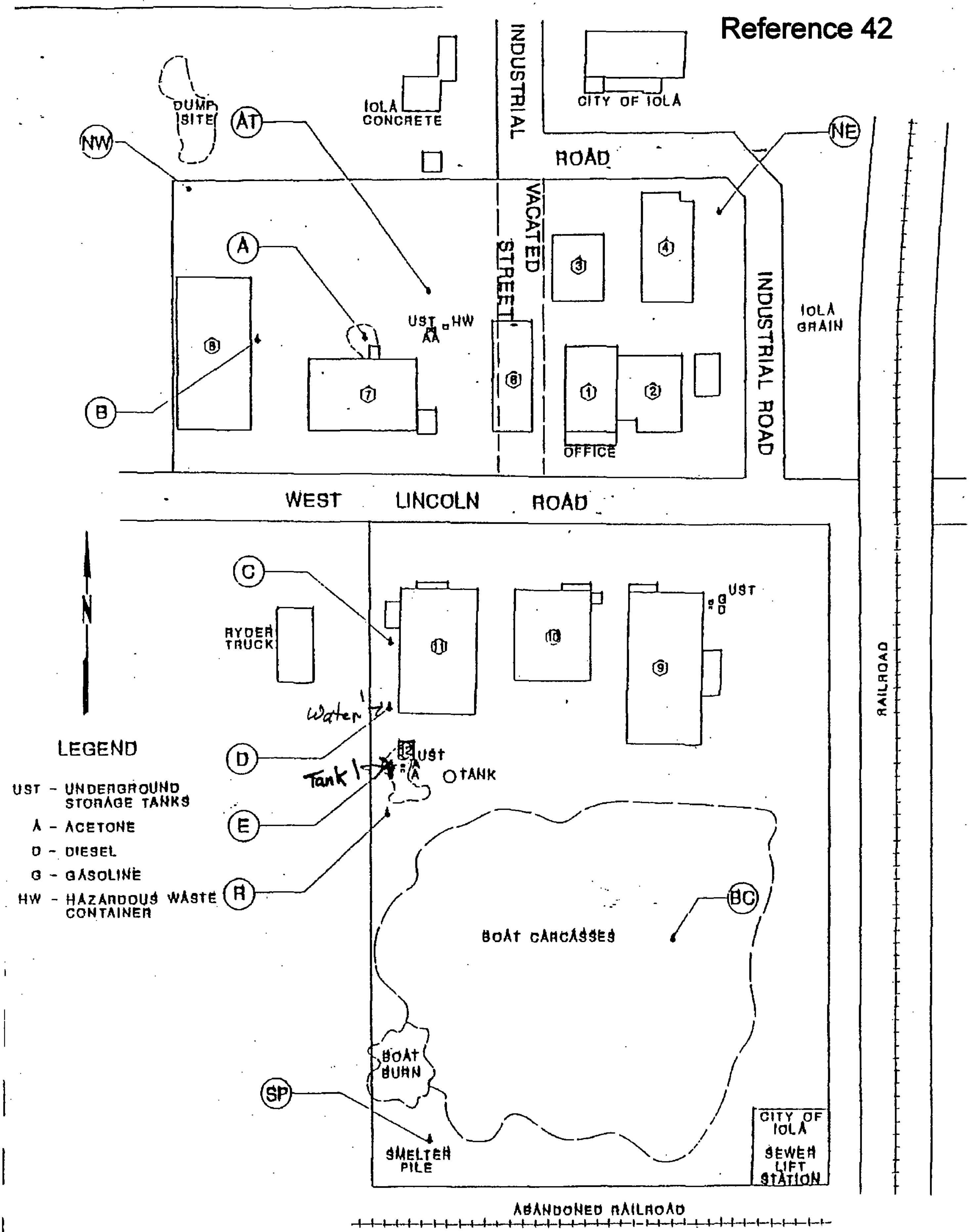
- o Boat carcasses were located throughout the property.

- o Resin spills were noted throughout the property.

SCOPE OF WORK - PHASE II RISK ASSESSMENT

On March 18-19, 1991, David Kincannon (Environmental Engineer) and Wayne Heiliger (Geotechnical Engineer) inspected the site and collected soil and water samples. A backhoe was used to collect soil samples at various depths. The holes dug by the backhoe were left open overnight and it was found that water flowed into five of the sample holes. The location of the sample points are shown on Figure 1. The sample sites included the following:

- NE (Northeast) — Samples were collected at this point to provide background data. However, the results suggest that the contamination extended to this site.
- SP (Smelter Pile) — This site in the southwest corner of the property appeared to contain smelter waste material.
- R (Resin Spill) — This location is near a resin spill at the surface and is downhill from two underground storage tanks.
- BC (Boat Carcasses) — This location is in the southeast part of the property where the remains of boat hulls are visible.
- NW (Northwest) — This area is located between the industry and a nearby creek. It had the lowest elevation of sites in the northern half of the property.
- AT (Acetone Tanks) — This site is located near two underground storage tanks and a hazardous waste container.


DUMP SITE
IOLA CONCRETE
INDUSTRIAL
CITY OF IOLA
ROAD
NW
AT
NE
A
VACATED STREET
UST HW
AA
IOLA GRAIN
INDUSTRIAL ROAD
B
OFFICE
WEST LINCOLN ROAD
N
C
RYDER TRUCK
UST
G
D
Water
D
UST
A
A
TANK
Tank 1
LEGEND
UST - UNDERGROUND STORAGE TANKS
A - ACETONE
D - DIESEL
G - GASOLINE
HW - HAZARDOUS WASTE CONTAINER
E
R
BC
BOAT CARCASSES
RAILROAD
BOAT BURN
SP
SMELTER PILE
CITY OF IOLA SEWER LIFT STATION
ABANDONED RAILROAD

- o A, B, C, D, and E — Surface grab samples were collected at various locations on the property. Sample A was collected in a resin spill area behind building 7, B was collected near chemical drums at building 8, C and D were collected on the west side of Building 11, and sample E was collected at the resin spill above two underground storage tanks.

The collected samples were bagged, marked and returned to Environmental Engineering Consultants, Inc. (EEC) laboratories and various analyses were conducted on the samples.

No samples were collected next to the underground storage tanks. Because of the age of the tanks, it is felt that these tanks will require removal and soil testing can be conducted at that time to properly evaluate the conditions of the disturbed soil.

RESULTS

The results of the analysis of these samples are provided in the enclosed tables. The various results will be presented under the headings of Metals, BTEX and Hydrocarbons, Priority Pollutants, COD, pH, and Moisture Content, and Geotechnical.

METALS

The samples were analyzed for cadmium, copper, lead, nickel, and zinc. Table I gives total metal content at the various sampling points. Cadmium, lead, and zinc concentrations were found to be very high for the surface samples at all sampling points except for site NW (Northwest). The concentration of metals are expressed in ppm which is equivalent to mg/Kg of soil. The highest concentrations found were: zinc = 84,350 ppm; lead = 42,800 ppm;

TABLE I

METALS

NE

Northeast (Background)

Sample Number	Depth feet	Cadmium ppm	Copper ppm	Lead ppm	Nickel ppm	Zinc ppm
1	0–1	140	200	6,000	45	6,950
2	2–3	140	20	70	25	3,300
3	4–5	60	10	11	12	1,680
4	7–8	90	10	38	16	2,540
5	10–11	40	BDL	30	BDL	1,275
Water	9.5	48	BDL	38	BDL	11,200

SP

Smelter Pile

Sample Number	Depth feet	Cadmium ppm	Copper ppm	Lead ppm	Nickel ppm	Zinc ppm
1	0–1.5	113	5,000	32,250	43	63,[illegible]3
2	3.5–4.5	BDL	20	60	12	3,833
3	4.5–5.5	BDL	20	144	15	900
4	5.5–6	17	105	713	15	3,440
5	6.5					
6	7.5					
7	8					
8	9					
9	9.5	BDL	10	53	18	533

R

Resin Spill

Sample Number	Depth feet	Cadmium ppm	Copper ppm	Lead ppm	Nickel ppm	Zinc ppm
1	0–1	95	404	3,333		84,350
2	1–2					
3	2–3					
4	4–5					
5	6–7					
6	9–10					
7	11–12					
Water	9					

BC

Boat Carcasses

Sample Number	Depth feet	Cadmium ppm	Copper ppm	Lead ppm	Nickel ppm	[illegible] ppm
1	0–1	140	868	10,000		28,486
2	1–2					
3	3–4					
4	5–6					
5	7.5–8.5					
6	10–11					
Water	12	BDL				53

BDL = Below detection limit

TABLE I

NW

NorthWest

Sample Number	Depth feet	Cadmium ppm	Copper ppm	Lead ppm	Nickel ppm	Zinc ppm
1	0–1	15	68	392		1,350
2	1–2					
3	2–3					
4	6–7					
5	8–9					
Water	3.5	BDL				53

AT

Acetone Tanks

Sample Number	Depth feet	Cadmium ppm	Copper ppm	Lead ppm	Nickel ppm	Zinc ppm
1	0–2	147	957	16,000		29,420
2	4–6					
Water	9.5					

BDL = Below detection limit

A, B, C, D, and E

Surface Grab Samples

Sample Number	Depth feet	Cadmium ppm	Copper ppm	Lead ppm	Nickel ppm	Zinc ppm
A	0–1	30	152	1,074		4,170
B	0–1	BDL	36	193		1,220
C	0–1	273	742	14,500		44,075
D	0–1	110	1,455	42,800		47,650
E	0–1	190	772	17,000		39,[illegible]

copper = 5,000 ppm; cadmium = 273 ppm; and nickel = 45 ppm. All concentrations except for Nickel are very high. The level of the metals decrease with the depth of the sample. This indicates that the main source of contamination is on the surface and that the metals are moving downward with rainfall infiltration and the concentrations of metals at subsurface depths have reached levels of concern. In addition, the water samples have metal concentrations at levels of concern.

In addition to the measurement of total metal content of the samples, the Toxicity Characteristics Leaching Procedure (TCLP) was performed on the surface sample at site SP (Smelter Pile). The TCLP is designed to determine the mobility of organic and inorganic contaminants present in liquid, soil, and multiphasic wastes. It was used here to determine the mobility of the metals present in the soils. The TCLP is also used to determine whether or not a material should be classified as hazardous. The results of the TCLP on the SP sample is given in Table II. Cadmium, lead, and zinc all are very high. These values are: cadmium = 2.0 mg/l; lead = 200 mg/l; and zinc = 356 mg/l.

BTEX AND HYDROCARBONS

No BTEX (benzene, toluene, ethylbenzene, or xylenes) were found in the samples analyzed. However, four(4) unidentified hydrocarbons peaks were observed. The relative quantities of these compounds are shown in Table III. The unidentified compounds are listed as A, B, C, and D. The quantity of the compound observed at the surface sample of the NE (Northeast) site has been given a value of 1.00. The quantities of all other samples are relative to this value. The concentrations of these unidentified hydrocarbons appear to be low.

TABLE II

TCLP TEST FOR METALS

Metal		Concentration mg/l
Cadmium		2.0
Copper		22.0
Nickel		0.1
Lead		200.0
Zinc		356.0

TABLE III

BTEX AND HYDROCARBONS

NE

Northeast (Background)

Sample Number	Depth feet	A	B	C	D
1	0–1	1.00	1.00	1.00	1.00
2	2–3	4.20	1.71	1.12	5.56
3	4–5	0.18	0.14	0.46	0.11
4	7–8	BDL	BDL	BDL	BDL
5	10–11	0.12	0.22	1.12	0.39
Water	9.5	BDL	BDL	BDL	BDL

NW

NorthWest

Sample Number	Depth feet	A	B	C	D
1	0–1	0.17	0.21	0.95	0.39
2	1–2	BDL	BDL	BDL	BDL
3	2–3	1.33	1.25	1.27	0.44
4	6–7	BDL	BDL	BDL	BDL
5	8–9	0.02	0.01	BDL	BDL
Water	3.5	BDL	BDL	0.71	0.78

BC

Boat Carcasses

Sample Number	Depth feet	A	B	C	D
1	0–1	0.53	0.12	BDL	BDL
2	1–2	0.51	0.10	BDL	BDL
3	3–4	BDL	BDL	BDL	BDL
4	5–6	BDL	BDL	BDL	BDL
5	7.5–8.5	BDL	BDL	BDL	BDL
6	10–11	BDL	BDL	BDL	BDL
Water	12	BDL	BDL	BDL	BDL

BDL = Below detection limit

PRIORITY POLLUTANTS

A list of the priority pollutants (Organic Toxic Pollutants) that were analyzed for are given in Table IV. No volatile or Base/Neutral compounds were observed in the samples. However, some acid compounds were observed. These included 4-nitrophenol (4-NP) and four (4) unidentified compounds. The concentration of the 4-nitrophenol was determined. Determination of the concentrations of the unidentified compounds was beyond the scope of this assessment. However, their relative concentrations are presented. These results are presented in Table V. The concentrations of the unidentified compounds are greater at the BC, SP, and R sample sites than at the NE (Background) site. It does not appear that the concentrations observed are of concern.

COD, pH, AND MOISTURE CONTENT

The COD (Chemical Oxygen Demand), pH, and moisture content of the samples were also determined. The COD is a test that measures the quantity of organic material present. The results are presented in Table VI. These analyses showed nothing significant.

GEOTECHNICAL

Selected soil samples were tested for physical properties pertinent to engineering classification. Descriptive logs of the test pits and a summary of the laboratory test results are presented in Table VII & VIII. Results from the field reconnaissance and pit excavations, laboratory testing and other descriptions of subsurface data are used to provide the generalized description and pertinence of the near surface soils at the Imp Boat facilities for the environmental assessment.

The surface topography is level with surface water drainage control by streets, ditches and natural drainageways. There is evidence that much of the site has been graded and filled to

TABLE IV

PRIORITY POLLUTANTS

Volatiles

acrolein
acrylonitrile
benzene
bromoform
carbon tetrachloride
chlorobenzene
chlorodibromomethane
chloroethane
2-chloroethylvinyl ether
chloroform
dichlorobromomethane
1,1-dichloroethane
1,2-dichloroethane
1,1-dichloroethylene
1,2-dichloropropane
1,3-dichloropropylene
ethylbenzene
methyl bromide
methyl chloride
methylene chloride
1,1,2,2-tetrachloroethane
tetrachloroethylene
toluene
1,2-trans-dichloroethylene
1,1,1-trichloroethane
1,1,2-trichloroethane
trichloroethylene
vinyl chloride

Acid Compounds

2-chlorophenol
2,4-dichlorophenol
2,4-dimethylphenol
2,6-dinitro-o-cresol
2,4-dinitrophenol
2-nitrophenol
4-nitrophenol
p-chloro-m-cresol
pentachlorophenol
phenol
2,4,6-trichlorophenol

Base/Neutral

acenaphthene
acenaphthylene
anthracene
bezidine
benzo(a)anthracene
benzo(a)pyrene
3,4-benzofluoranthene
benzo(ghi)perylene
benzo(k)fluoranthene
bis(2-chloroethoxy)methane
bis(2-chloroethyl)ether
bis(2-chloroisopropyl)ether
bis(2-ethylhexyl)phthalate
4-bromophenyl phenyl ether

Base/Nuetral (cont.)

butylbenzyl phthalate
2-chloronaphthalene
4-chlorophenyl phenyl ether
chrysene
dibenzo(a,h)anthracene
1,2-dichlorobenzene
1,3-dichlorobenzene
1,4-dichlorobenzene
3,3-dichlorobenzidine
diethyl phthalate
dimethyl phthalate
di-n-butyl phthalate
2,4-dinitrotoluene
2,6-dinitrotoluene
di-n-octyl phthalate
1,2-diphenylhydrazine (as azobenzene)
fluroranthene
fluorene
hexachlorobenzene
hexachlorobutadiene
hexachlorocyclopentadiene
hexachloroethane
indeno(1,2,3-cd)pyrene
isophorone
napthalene
nitrobenzene
N-nitrosodimethylamine
N-nitrosodi-n-propylamine
N-nitrosodiphenylamine
phenanthrene
pyrene
1,2,4-trichlorobenzen

TABLE V

PRIORITY POLLUTANTS – ACID COMPOUNDS

NE

Northeast (Background)

Sample Number	Depth feet	4-NP mg/Kg	A	B	C	D
1	0–1	114	1.00	1.00	1.00	BDL
2	2–3	190	0.81	2.00	3.87	1.00
3	4–5	BDL	0.81	BDL	6.23	BDL
4	7–8	758	1.14	BDL	1.90	BDL
5	10–11	474	1.33	BDL	2.57	BDL
Water	9.5					

BC

Boat Carcasses

Sample Number	Depth feet	4-NP mg/Kg	A	B	C	D
1	0–1	242	1.67	2.78	6.40	[illegible]
2	1–2	322	1.10	BDL	9.37	BDL
3	3–4	100	0.86	BDL	4.67	BDL
4	5–6	BDL	BDL	BDL	BDL	BDL
5	7.5–8.5	180	0.86	BDL	4.67	BDL
6	10–11	65	1.19	BDL	3.17	BDL
Water	12					

SP

Smelter Pile

Sample Number	Depth feet	4-NP mg/Kg	A	B	C	D
1	0–1.5					
2	3.5–4.5					
3	4.5–5.5					
4	5.5–6					
5	6.5	87	1.14	BDL	1.37	BDL
6	7.5					
7	8					
8	9					
9	9.5					

R

Resin Spill

Sample Number	Depth feet	4-NP mg/Kg	A	B	C	D
1	0–1					
2	1–2					
3	2–3					
4	4–5					
5	6–7	123	1.38	BDL	6.07	BDL
6	9–10					
7	11–12					
Water	9					

BDL = Below detection limit

TABLE VI

COD, pH, AND MOISTURE CONTENT

NE

Northeast (Background)

Sample Number	Depth feet	COD ppm	pH s.u.	Moisture Content
1	0–1	1,520	8.1	23%
2	2–3	174	5.0	23%
3	4–5	49	5.2	17%
4	7–8	102	5.3	19%
5	10–11	48	6.0	16%
Water	9.5	BDL	7.0	

SP

Smelter Pile

Sample Number	Depth feet	COD ppm	pH s.u.	Moisture Content
1	0–1.5	1,718	6.6	18%
2	3.5–4.5	210	6.6	24%
3	4.5–5.5	233	6.7	23%
4	5.5–6	242	6.7	23%
5	6.5			
6	7.5			
7	8			
8	9			
9	9.5	23	7.6	19%

R

Resin Spill

Sample Number	Depth feet	COD ppm	pH s.u.	Moisture Content
1	0–1	919	6.5	23%
2	1–2	568	6.4	14%
3	2–3	66	7.1	17%
4	4–5			
5	6–7	40	7.8	19%
6	9–10			
7	11–12	15	7.6	22%
Water	9	1	8.0	

BC

Boat Carcasses

Sample Number	Depth feet	COD ppm	pH s.u.	Moisture Content
1	0–1	2,023	7.2	13%
2	1–2	42	6.5	12%
3	3–4	372	6.4	23%
4	5–6			
5	7.5–8.5	41	7.8	17%
6	10–11	117	7.9	18%
Water	12	6	8.1	

BDL = Below detection limit

TABLE VI

Reference 42

NW

NorthWest

Sample Number	Depth feet	COD ppm	pH s.u.	Moisture Content
1	0–1	328	7.2	19%
2	1–2			
3	2–3	12	6.3	18%
4	6–7			
5	8–9	17	7.4	19%
Water	3.5	0	8.2	

AT

Acetone Tanks

Sample Number	Depth feet	COD ppm	pH s.u.	Moisture Content
1	0–2	2,264	7.6	18%
2	4–6	267	7.4	21%
Water	9.5	0	8.0	

A, B, C, D, and E

Surface Grab Samples

Sample Number	Depth feet	COD ppm	pH s.u.	Moisture Content
A	0–1	342	7.9	13%
B	0–1	196	8.1	11%
C	0–1	2,089	7.7	19%
D	0–1	4,539	7.1	24%
E	0–1	1,403	7.0	21%

BDL = Below detection limit

TABLE VII

SP

Smilter Pile

Depth	Material Description
0- 3.5	Fill, Clinkers with some black and reddish orange fine sand
3.5- 4.5	Grayish black silty clay
4.5- 6.0	Black clay
6.0-11.0	Mottled grayish brown with orange clay 8 ft, grades blocky structure and crumbles 11 ft, grades more orange
	No water observed

R

Resin Spill

Depth	Material Description
0- 2.0	Fill, clinkers with black fine sand
2.0- 3.5	Grayish black silty clay
3.5- 7.0	Light gray clay/silty clay
7.0-12.0	Mixed gray and orange silty clay
	8 ft, crumbles
	9 ft, grades more silt
	10 ft, mixed silt and clay lenses
	Water stabilized at 9 ft.

BC

Boat Carcasses

Depth	Material Description
0- 0.5	Fill, clinkers with black fine sand
0.5- 2.0	Gray silty clay with some fine to medium sand
2.0- 2.2	Black coarse sandstone
2.2- 6.5	Black slightly clayey silt
	5 ft, grades more clay
6.5- 9.5	Gray silty clay
9.5-12.0	Mottled gray and orange silty clay
	Water stabilized at 12 ft.

TABLE VII (cont.)

NW

North West

Depth	Material Description
0- 1.0	Topsoil, black silt
1.0- 3.5	Dark grayish brown and black silty clay
3.5- 5.0	Mottled gray and orange silty clay
5.0- 7.0	Mottled light gray and orange silty clay crumbles with hand pressure
7.0- 9.0	Mottled gray and orange silty clay
9.0-10.0	Light gray silty sand-sandy silt saturated
10.0-10.5	Mottled light gray and orange silty clay with occasional sand seam
	Water stabilized at 3.5 ft.

NE

North East

Depth	Material Description
0- 1.0	Fill, black silty clay with bricks and some lumber
1.0- 2.0	Black silt with trace of clay
2.0- 4.0	Black silty clay
4.0- 6.0	Grayish brown silty clay crumbles
6.0-10.0	Mottled orange and gray silty clay crumbles
10.0-11.5	Orange and gray silty clay
	Water stabilized at 9.5 ft.

AT

Acetone Tanks

Depth	Material Description
0- 3.5	Fill, black silty sand-sandy silt with clinkers
3.5- 6.5	Dark gray and black clay 4.5 ft, grades some orange
6.5-11.0	Mottled orange and gray clay 8 ft, grades more gray and crumbles
11.0-12.0	Gray silty clay crumbles
	Water stabilized at 9.0 ft.

TABLE VIII

SUMMARY OF LABORATORY TEST RESULTS

Test Pit Designation	Depth (ft.)	Moisture Content	Liquid Limit	Plastic Limit	Plasticity Index
SP	5.5	33.0	61	24	37
SP	6.5&9.5	23.6	52	17	35
R	2.5	21.6	43	18	25
R	6.5	25.6	51	18	33
BC	8.0	22.1	42	15	27
BC	10.5	22.7	47	16	31
NW	2.5	22.8	44	18	26
NW	8.5	24.6	39	16	23
NE	4.5	23.0	42	17	30
NE	7.5	25.0	47	15	19
AT	5.0	33.2	61	21	40

accommodate the many buildings and exterior pavements. The south and southwest portion of the site has mounds of smelter waste from previous activities.

The shallow subsurface profile at the site is dominated by the presence of residual clayey soils formed by weathering of underlying Pennsylvanian shales. Engineering classifications are silty clay and clay soils. These medium to high plasticity soils have moderate to high volumetric change when subject to varying moisture conditions. The lower extremes of some of the test pits revealed silty and sandy clays, and other data indicate mixtures of gravel and clays at depths of 12 to 20 feet. Although the test pits were excavated to a maximum depth of 12.0 feet, other data indicated that the shale is at depths of approximately 20 to 25 feet.

Shallow groundwater, 3.5 to 12.0 feet below ground surface, was observed at the site and reported as a general occurrence in other parts of the city. The field exploration was conducted on March 18-19, 1991. Variations, perhaps 5 feet or more, of vertical groundwater position can be expected in shallow aquifers and usually coincide with yearly precipitation patterns. Also, the gradient of shallow groundwater reflects the areal ground surface. It appears that the underlying shale is an aquitard and the groundwater moves laterally between the ground surface and the underlying shale.

Although the subsurface soils are clays and silty clays, the groundwater flow was significantly greater than would be expected from generalized engineering relationships between soil classification and permeability. The inflow of water during test pit excavation was noticeable and fairly rapid when the phreatic surface was reached. The surface clay soils, 1 to 4 feet depth, had an apparent higher shear strength than the soils 4 to 10 feet in depth. The texture of the intermediate clays would crumble with slight hand pressure but became tough to very tough upon remolding, much like the clays at the surface. This observation could be explained by the previous stress history influenced by deterioration of the rock bonds and soil shrinkage from desiccation. The overall importance of this observation is the ability of the subsurface materials to readily allow groundwater flow through the subsurface soils above the shallow shale bedrock.

DISCUSSION OF RESULTS

The act of declaring a site hazardous is reserved to the appropriate governmental agency. One test used by regulatory agencies is the TCLP. Table IX provides the regulatory level for metals and a comparison with the results of this assessment. A material is considered hazardous when the TCLP for that material exceeds these regulatory levels. If the regulatory levels in Table IX for cadmium and lead are compared with the TCLP values determined in this assessment, it is seen that the cadmium and lead levels in the sample analyzed was 2.0 mg/l and 200 mg/l respectively which exceeds the regulatory levels of 1.0 mg/l for cadmium and 5.0 mg/l for lead and the soil material on site would most likely be classified as Hazardous. There is no regulatory level for zinc, however, it is seen that the level of zinc is 356 mg/l which is very high.

Table X provides typical concentrations of metals in soils and it was found that cadmium, lead, and zinc concentrations in the samples analyzed greatly exceeded the typical concentrations. This indicates that metal contamination occurs at the site.

Table XI provides the Sludge Disposal regulations for Metals that have been established by the State of Texas. The Texas regulations are used here, because at this time Kansas has not adopted sludge regulations comparable with these, however, it is expected that they will in the near future. If the results

TABLE I⸝

TCLP EXTRACTION REGULATORY LEVEL

Metal	Regulatory Level mg/l	Site Concentration mg/l
Cadmium	1.0	2.0
Copper	none	22.0
Nickel	none	0.1
Lead	5.0	200.0
Zinc	none	356.0

TABLE X

TYPICAL CONCENTRACTIONS OF METALS

Metal	Typical Value mg/kg	Range mg/kg
Cadmium	0.06	0.01 – 7
Copper	20	2 – 100
Lead	10	2 – 200
Nickel	40	10 – 1000
Zinc	50	10 – 300

TABLE XI

STATE OF TEXAS SLUDGE DISPOSAL REGULATIONS FOR METALS

Pollutant	Sludge Limit mg/kg	Surface Sample Site SP mg/kg
Cadmium	25	113
Copper	1,000	5,000
Lead	500	32,250
Nickel	200	43
Zinc	2,000	63,333

presented in Table II are compared with these values, it is seen that the site values greatly exceeded those allowed for sludge disposal. Again, this indicates that the metal content in the soils at the IMP BOAT site are very high.

The analysis of the samples indicate no problems with organic contamination. However, it must be recognized that samples were not collected next to the underground storage tanks. There could be organic contaminates in the vicinity of the underground storage tanks.

CONCLUSIONS

This Phase II Environmental Risk Assessment for the property occupied by IMP Boats, Inc. has shown that the metal content such as cadmium, lead, and zinc exceed acceptable levels and it is possible that this site could be classified as a hazardous site. If it was to be classified as hazardous, the property would be required to be cleaned by removing the contaminated soil and disposing of the soil in an approved hazardous wastes landfill. The estimated cost for removal of contaminated soil, disposal in an approved hazardous waste site, and replacement of soil is $120,000 - $160,000 per acre per foot of depth.

ATTACHMENT 2

LABORATORY ANALYSIS

KANSAS DEPARTMENT OF HEALTH AND ENVIRONMENT
Kansas Health & Environmental Laboratory
Organic Chemistry Laboratory
Topeka, Kansas 66620

GC/MS ANALYSIS REPORT

Report To: DANNY COOPER-BER — Lab Number: 2024690C
Address: FORBES BLDG. 740, TOPEKA, KS. 66620 — Report Date: 11-25-91

SAMPLE COLLECTION INFORMATION

Site ID No.: — Program Code: ER — Sample Type: WATER
Collection Site: IOLA WATER 1
Collected By: BER-COOPER — Date: 11-12-91 — Time: 1530

RESULTS OF ANALYSIS

PURGABLE ORGANICS	Concentration (UG/L)	Reporting Limit (UG/L)
CHLOROMETHANE	NOT DETECTED	5.0
BROMOMETHANE	NOT DETECTED	1.2
VINYL CHLORIDE	NOT DETECTED	0.8
CHLOROETHANE	NOT DETECTED	3.7
DICHLOROMETHANE	12.1	0.9
1,1-DICHLOROETHYLENE	NOT DETECTED	0.6
1,1-DICHLOROETHANE	NOT DETECTED	0.5
TRANS &/OR CIS 1,2-DICHLOROETHYLENE	NOT DETECTED	0.5
TRICHLOROMETHANE (THM)	NOT DETECTED	0.5
1,2-DICHLOROETHANE	NOT DETECTED	0.6
1,1,1-TRICHLOROETHANE	NOT DETECTED	0.7
TETRACHLOROMETHANE	NOT DETECTED	0.7
BROMODICHLOROMETHANE (THM)	NOT DETECTED	0.5
1,2-DICHLOROPROPANE	NOT DETECTED	0.5
TRANS 1,3-DICHLOROPROPENE	NOT DETECTED	0.8
TRICHLOROETHYLENE	NOT DETECTED	0.6
BENZENE	NOT DETECTED	0.5
DIBROMOCHLOROMETHANE (THM)	NOT DETECTED	0.7
CIS 1,3-DICHLOROPROPENE	NOT DETECTED	0.9
1,1,2-TRICHLOROETHANE	NOT DETECTED	0.6
BROMOFORM (THM)	NOT DETECTED	1.5
1,1,2,2-TETRACHLOROETHANE	NOT DETECTED	0.6
TETRACHLOROETHYLENE	NOT DETECTED	1.1
TOLUENE	NOT DETECTED	0.5
CHLOROBENZENE	NOT DETECTED	0.5
ETHYLBENZENE	NOT DETECTED	0.7
META-XYLENE	NOT DETECTED	0.6
ORTHO &/OR PARA-XYLENE	NOT DETECTED	0.6
1,3-DICHLOROBENZENE	NOT DETECTED	1.0
1,2-DICHLOROBENZENE	NOT DETECTED	1.0
1,4-DICHLOROBENZENE	NOT DETECTED	1.0

Comment: THE SAMPLE WAS RECEIVED WITH THE SEPTUM UPSIDE DOWN. THIS MAY HAVE RESULTED IN THE LOSS OF VOLATILES. ONE UNIDENTIFIED COMPOUND WAS INDICATED.

Analyst: RICHARD L. PIERCE RLP — Roger H. Carlson, Ph.D., Director

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KANSAS DEPARTMENT OF HEALTH AND ENVIRONMENT
Kansas Health & Environmental Laboratory
Organic Chemistry Laboratory
Topeka, Kansas 66620

GC/MS ANALYSIS REPORT

Report To: DANNY COOPER-BER
Address: FORBES BLDG. 740, TOPEKA, KS. 66620

Lab Number: 2024700C
Report Date: 11-25-91

SAMPLE COLLECTION INFORMATION

Site ID No.:
Program Code: ER
Sample Type: WATER
Collection Site: IOLA TANK 1
Collected By: BER-COOPER
Date: 11-12-91
Time: 1330

RESULTS OF ANALYSIS

PURGABLE ORGANICS	Concentration (UG/L)	Reporting Limit (UG/L)
CHLOROMETHANE	NOT DETECTED	5.0
BROMOMETHANE	NOT DETECTED	1.2
VINYL CHLORIDE	NOT DETECTED	0.8
CHLOROETHANE	NOT DETECTED	3.7
DICHLOROMETHANE	NOT DETECTED	0.9
1,1-DICHLOROETHYLENE	NOT DETECTED	0.6
1,1-DICHLOROETHANE	NOT DETECTED	0.5
TRANS &/OR CIS 1,2-DICHLOROETHYLENE	6.4	0.5
TRICHLOROMETHANE (THM)	NOT DETECTED	0.5
1,2-DICHLOROETHANE	NOT DETECTED	0.6
1,1,1-TRICHLOROETHANE	NOT DETECTED	0.7
TETRACHLOROMETHANE	NOT DETECTED	0.7
BROMODICHLOROMETHANE (THM)	NOT DETECTED	0.5
1,2-DICHLOROPROPANE	NOT DETECTED	0.5
TRANS 1,3-DICHLOROPROPENE	NOT DETECTED	0.8
TRICHLOROETHYLENE	1.0	0.6
BENZENE	NOT DETECTED	0.5
DIBROMOCHLOROMETHANE (THM)	NOT DETECTED	0.7
CIS 1,3-DICHLOROPROPENE	NOT DETECTED	0.9
1,1,2-TRICHLOROETHANE	NOT DETECTED	0.6
BROMOFORM (THM)	NOT DETECTED	1.5
1,1,2,2-TETRACHLOROETHANE	NOT DETECTED	0.6
TETRACHLOROETHYLENE	1.7	1.1
TOLUENE	NOT DETECTED	0.5
CHLOROBENZENE	NOT DETECTED	0.5
ETHYLBENZENE	NOT DETECTED	0.7
META-XYLENE	NOT DETECTED	0.6
ORTHO &/OR PARA-XYLENE	NOT DETECTED	0.6
1,3-DICHLOROBENZENE	NOT DETECTED	1.0
1,2-DICHLOROBENZENE	NOT DETECTED	1.0
1,4-DICHLOROBENZENE	NOT DETECTED	1.0

Comment: METHYL TERT. BUTYL ETHER (MTBE) WAS INDICATED TO BE PRESENT.

Analyst: RICHARD L. PIERCE RLP

Roger H. Carlson, Ph.D., Director

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KANSAS DEPARTMENT OF HEALTH AND ENVIRONMENT
Kansas Health & Environmental Laboratory
Organic Chemistry Laboratory
Topeka, Kansas 66620

GC/MS ANALYSIS REPORT

Report To: DANNY COOPER-BER
Address: FORBES BLDG. 740, TOPEKA, KS. 66620

Lab Number: 2024680C
Report Date: 11-25-91

SAMPLE COLLECTION INFORMATION

Site ID No.:
Program Code: ER
Sample Type: WATER
Collection Site: IOLA TANK 2
Collected By: BER-COOPER
Date: 11-12-91
Time: 1730

RESULTS OF ANALYSIS

PURGABLE ORGANICS	Concentration (UG/L)	Reporting Limit (UG/L)
CHLOROMETHANE	NOT DETECTED	5.0
BROMOMETHANE	NOT DETECTED	1.2
VINYL CHLORIDE	NOT DETECTED	0.8
CHLOROETHANE	NOT DETECTED	3.7
DICHLOROMETHANE	NOT DETECTED	0.9
1,1-DICHLOROETHYLENE	NOT DETECTED	0.6
1,1-DICHLOROETHANE	NOT DETECTED	0.5
TRANS &/OR CIS 1,2-DICHLOROETHYLENE	NOT DETECTED	0.5
TRICHLOROMETHANE (THM)	NOT DETECTED	0.5
1,2-DICHLOROETHANE	NOT DETECTED	0.6
1,1,1-TRICHLOROETHANE	NOT DETECTED	0.7
TETRACHLOROMETHANE	NOT DETECTED	0.7
BROMODICHLOROMETHANE (THM)	NOT DETECTED	0.5
1,2-DICHLOROPROPANE	NOT DETECTED	0.5
TRANS 1,3-DICHLOROPROPENE	NOT DETECTED	0.8
TRICHLOROETHYLENE	1.7	0.6
BENZENE	NOT DETECTED	0.5
DIBROMOCHLOROMETHANE (THM)	NOT DETECTED	0.7
CIS 1,3-DICHLOROPROPENE	NOT DETECTED	0.9
1,1,2-TRICHLOROETHANE	NOT DETECTED	0.6
BROMOFORM (THM)	NOT DETECTED	1.5
1,1,2,2-TETRACHLOROETHANE	NOT DETECTED	0.6
TETRACHLOROETHYLENE	NOT DETECTED	1.1
TOLUENE	NOT DETECTED	0.5
CHLOROBENZENE	NOT DETECTED	0.5
ETHYLBENZENE	NOT DETECTED	0.7
META-XYLENE	NOT DETECTED	0.6
ORTHO &/OR PARA-XYLENE	NOT DETECTED	0.6
1,3-DICHLOROBENZENE	NOT DETECTED	1.0
1,2-DICHLOROBENZENE	NOT DETECTED	1.0
1,4-DICHLOROBENZENE	NOT DETECTED	1.0

Comment: TRACE LEVEL OF ONE UNIDENTIFIED COMPOUND WAS INDICATED.

Analyst: RICHARD L. PIERCE RLP

Roger H. Carlson, Ph.D., Director

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REMEDIATION

Reference 42

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BUREAU OF ENVIRONMENTAL REMEDIATION

KANSAS HEALTH AND ENVIRONMENTAL LABORATORY
Department of Health and Environment
Inorganic Chemistry Laboratory
Bldg. 740, Forbes Field, Topeka, KS 66620-8420
(913) 296-1657

RESULTS OF LABORATORY ANALYSES

Report To: DANNY COOPER-BER
Address:

Lab Number: 201090PT
Lab Acct Code: BER
Env Acct Code: ER

Locality: IOLA Water 1

Collected By: COOPER | Time: 1530 | Depth: ****

Site ID: | Matrix: Water

Date Collected: 11-12-91
Date Received: 11-13-91
Date Reported: 11-27-91

Comments:

* *

Results Expressed In Milligrams/Liter

Total Hard.		pH (Units)	NA	Aluminum	LT	0.026
(CaCO3)	NA	Turbidity (NTU)	NA	Antimony	LT	0.01
Calcium	71.720	Spec. Conductance		Arsenic	LT	0.021
Magnesium	15.149	(micromhos/cm)	NA	Barium		0.118
Sodium	64.083	T. Dissolved Solids	NA	Beryllium	LT	0.001
Potassium	1.34	Total Phosphorus (P)	NA	Cadmium		0.003
		Silica (SiO2)	13.446	Chromium	LT	0.003
Total Alk.		Boron	0.069	Cobalt		0.048
(CaCO3)	NA	Dissolved Oxygen	NA	Copper		0.021
Chloride	NA	BOD	NA	Iron		0.020
Sulfate	NA	COD	NA	Lead	LT	0.02
Nitrate (N)	NA	CBOD	NA	Manganese		4.057
Nitrite	NA	Ammonia (N)	NA	Mercury		NA
Fluoride	NA	T. Sus. Solids	NA	Molybdenum		0.019
		Corrosivity (LI)	NA	Nickel		0.031
Cyanide	NA	Kjeldahl Nitrogen	NA	Selenium	LT	0.03
Oil/Grease	NA	Chromium (+6)	NA	Silver	LT	0.004
Phenols	NA	Tin	NA	Thallium	LT	0.015
TDP	NA	MBAS	NA	Vanadium	LT	0.003
Sulfide	NA	Flash Pt (Celsius)	NA	Zinc		1.508
Total Coliform	NA					
Fecal Coliform	NA					
Fecal Strep	NA					

Chemist: JKR   NA - Not Analyzed   LT - Less Than

* *

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KANSAS HEALTH AND ENVIRONMENTAL LABORATORY
Department of Health and Environment
Inorganic Chemistry Laboratory
Bldg. 740, Forbes Field, Topeka, KS 66620-8420
(913) 296-1657

RESULTS OF LABORATORY ANALYSES

Report To: DANNY COOPER-BER
Address:

Lab Number: 201091PT
Lab Acct Code: BER
Env Acct Code: ER

Locality: IOLA Tank 1

Collected By: COOPER　Time: 1330　Depth: ****

Site ID:　Matrix: Water

Date Collected: 11-12-91
Date Received: 11-13-91
Date Reported: 11-25-91

Comments:

* *

Results Expressed In Milligrams/Liter

Total Hard. (CaCO3)	NA	pH (Units)	NA	Aluminum		0.04
		Turbidity (NTU)	NA	Antimony		0.02
Calcium	175.639	Spec. Conductance (micromhos/cm)	NA	Arsenic	LT	0.021
Magnesium	41.700			Barium		0.053
Sodium	178.239	T. Dissolved Solids	NA	Beryllium	LT	0.001
Potassium	0.75	Total Phosphorus (P)	NA	Cadmium		0.003
		Silica (SiO2)	14.278	Chromium		0.004
Total Alk. (CaCO3)	NA	Boron	0.036	Cobalt		0.007
		Dissolved Oxygen	NA	Copper		0.028
Chloride	NA	BOD	NA	Iron		0.046
Sulfate	NA	COD	NA	Lead	LT	0.02
Nitrate (N)	NA	CBOD	NA	Manganese		1.439
Nitrite	NA	Ammonia (N)	NA	Mercury		NA
Fluoride	NA	T. Sus. Solids	NA	Molybdenum		0.025
		Corrosivity (LI)	NA	Nickel		0.015
Cyanide	NA	Kjeldahl Nitrogen	NA	Selenium	LT	0.03
Oil/Grease	NA	Chromium (+6)	NA	Silver	LT	0.004
Phenols	NA	Tin	NA	Thallium	LT	0.015
TDP	NA	MBAS	NA	Vanadium	LT	0.003
Sulfide	NA	Flash Pt (Celsius)	NA	Zinc		0.235
Total Coliform	NA					
Fecal Coliform	NA					
Fecal Strep	NA					

Chemist: JKR　NA - Not Analyzed　LT - Less Than

* *

Copy To: File

KANSAS HEALTH AND ENVIRONMENTAL LABORATORY
Department of Health and Environment
Inorganic Chemistry Laboratory
Bldg. 740, Forbes Field, Topeka, KS 66620-8420
(913) 296-1657

RESULTS OF LABORATORY ANALYSES

Report To: DANNY COOPER-BER
Address:

Lab Number: 201092PT
Lab Acct Code: BER
Env Acct Code: ER

Locality: IOLA TANK 2

Collected By: COOPER   Time: 1730   Depth: ****

Site ID: Matrix: Water

Date Collected: 11-12-91
Date Received: 11-13-91
Date Reported: 11-25-91

Comments: SAMPLE FILTERED

* *

Results Expressed In Milligrams/Liter

Total Hard.		pH (Units)	NA	Aluminum	LT	0.026
(CaCO3)	NA	Turbidity (NTU)	NA	Antimony		0.01
Calcium	154.347	Spec. Conductance		Arsenic	LT	0.021
Magnesium	23.032	(micromhos/cm)	NA	Barium		0.209
Sodium	54.565	T. Dissolved Solids	NA	Beryllium	LT	0.001
Potassium	2.52	Total Phosphorus (P)	NA	Cadmium	LT	0.002
		Silica (SiO2)	17.195	Chromium		0.003
Total Alk.		Boron	0.108	Cobalt		0.023
(CaCO3)	NA	Dissolved Oxygen	NA	Copper		0.014
Chloride	NA	BOD	NA	Iron		0.787
Sulfate	NA	COD	NA	Lead	LT	0.02
Nitrate (N)	NA	CBOD	NA	Manganese		3.301
Nitrite	NA	Ammonia (N)	NA	Mercury		NA
Fluoride	NA	T. Sus. Solids	NA	Molybdenum		0.010
		Corrosivity (LI)	NA	Nickel	LT	0.007
Cyanide	NA	Kjeldahl Nitrogen	NA	Selenium	LT	0.03
Oil/Grease	NA	Chromium (+6)	NA	Silver	LT	0.004
Phenols	NA	Tin	NA	Thallium	LT	0.015
TDP	NA	MBAS	NA	Vanadium	LT	0.003
Sulfide	NA	Flash Pt (Celsius)	NA	Zinc		0.708
Total Coliform	NA					
Fecal Coliform	NA					
Fecal Strep	NA					

Chemist: JKR   NA - Not Analyzed   LT - Less Than

* *

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NOV 27 1991

BUREAU OF ENVIRONMENTAL REMEDIATION

KANSAS HEALTH AND ENVIRONMENTAL LABORATORY
Department of Health and Environment
Inorganic Chemistry Laboratory
Bldg. 740, Forbes Field, Topeka, KS 66620-8420
(913) 296-1657

RESULTS OF LABORATORY ANALYSES

Report To: DANNY COOPER-BER
Address:

Lab Number: 201089PT
Lab Acct Code: BER
Env Acct Code: ER

Locality: IOLA BG SOIL

Collected By: COOPER Time: **** Depth: 1.5

Site ID: Matrix: Soil

Date Collected: 11-12-91
Date Received: 11-13-91
Date Reported: 11-26-91

Comments:
ACID LEACH ANALYSIS COMPLETE.

* *

Results Expressed in Milligrams/Kilogram

Total Hard.		pH (Units)	NA	Aluminum		11615.06
(CaCO3)	NA	Turbidity (NTU)	NA	Antimony	LT	1.0
Calcium	3671.312	Spec. Conductance		Arsenic		9.033
Magnesium	1128.090	(micromhos/cm)	NA	Barium		90.610
Sodium	163.764	T. Dissolved Solids	NA	Beryllium		0.837
Potassium	474.89	Total Phosphorus (P)	NA	Cadmium		0.398
		Silica (SiO2)	6726.506	Chromium		12.458
Total Alk.		Boron	5.997	Cobalt		4.208
(CaCO3)	NA	Dissolved Oxygen	NA	Copper		9.769
Chloride	NA	BOD	NA	Iron		8495.561
Sulfate	NA	COD	NA	Lead		25.200
Nitrate (N)	NA	CBOD	NA	Manganese		72.767
Nitrite	NA	Ammonia (N)	NA	Mercury		0.0500
Fluoride	NA	T. Sus. Solids	NA	Molybdenum		0.299
		Corrosivity (LI)	NA	Nickel		7.527
Cyanide	NA	Kjeldahl Nitrogen	NA	Selenium	LT	3.0
Oil/Grease	NA	Chromium (+6)	NA	Silver	LT	0.4
Phenols	NA	Tin	NA	Thallium	LT	1.5
TDP	NA	MBAS	NA	Vanadium		13.089
Sulfide	NA	Flash Pt (Celsius)	NA	Zinc		85.319
Total Coliform	NA					
Fecal Coliform	NA					
Fecal Strep	NA					

Chemist: JKR NA - Not Analyzed LT - Less Than

* *

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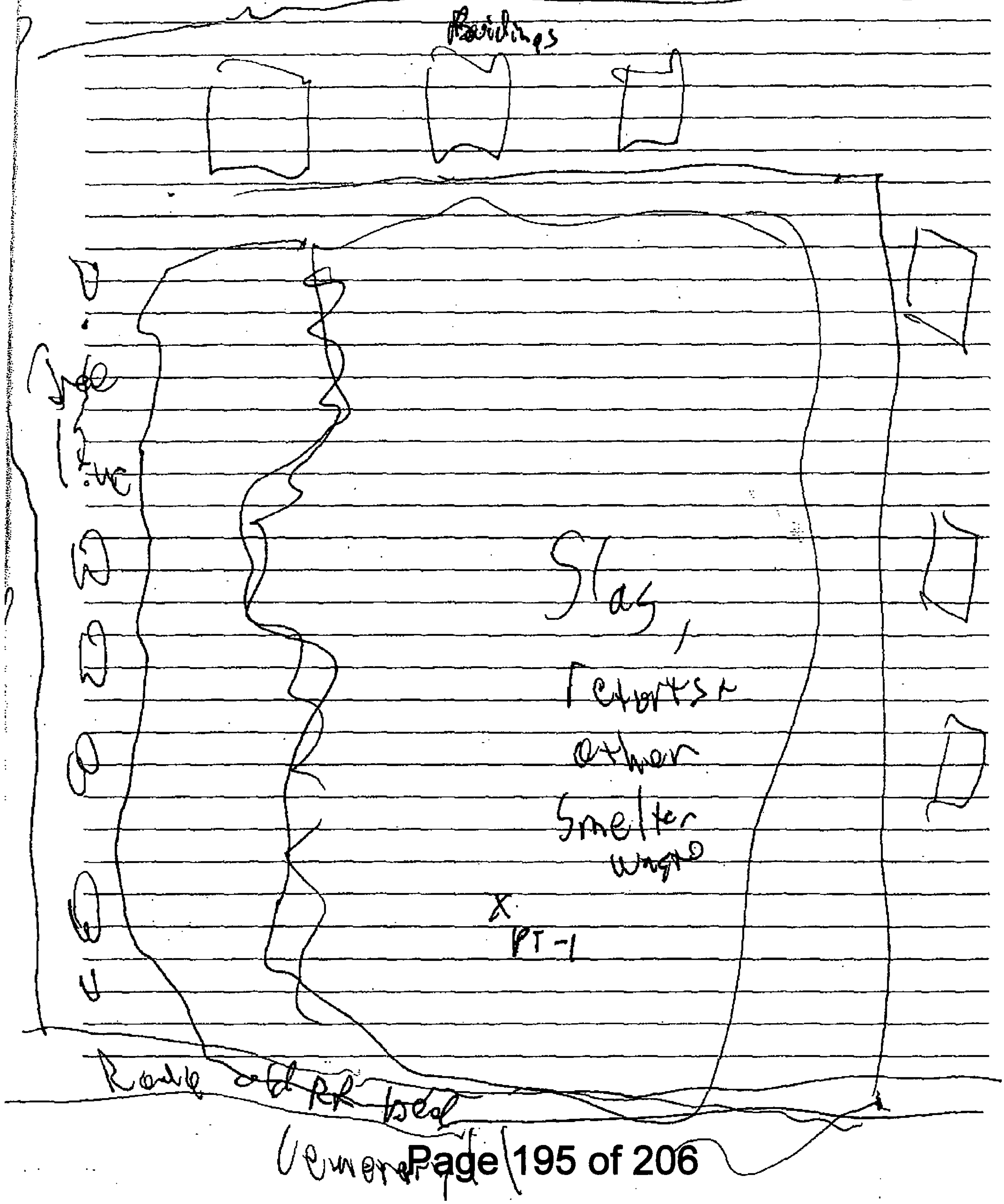
10.4 Field Notes

FMP Boggs [illegible]/14/2012

Brown On-Site 1230 Recon + photos

PT-1 37.92602 -095.41302 on large pile w/ 2 coln

Walked



SW Corner	37.92577	-095.41468
SE Corner	37.92582	-095.41095
NW corner	37.92841	-095.41480
NE corner	37.92810	-095.41097
PT-1	37.92602	-095.41302

10.5 Hazardous Substance Information

ATSDR
AGENCY FOR TOXIC SUBSTANCES AND DISEASE REGISTRY

LEAD

CAS # 7439-92-1

Division of Toxicology and Environmental Medicine ToxFAQs™ September 2005

This fact sheet answers the most frequently asked health questions (FAQs) about lead. For more information, call the ATSDR Information Center at 1-888-422-8737. This fact sheet is one in a series of summaries about hazardous substances and their health effects. It is important you understand this information because this substance may harm you. The effects of exposure to any hazardous substance depend on the dose, the duration, how you are exposed, personal traits and habits, and whether other chemicals are present.

HIGHLIGHTS: Exposure to lead can happen from breathing workplace air or dust, eating contaminated foods, or drinking contaminated water. Children can be exposed from eating lead-based paint chips or playing in contaminated soil. Lead can damage the nervous system, kidneys, and reproductive system. Lead has been found in at least 1,280 of the 1,662 National Priority List sites identified by the Environmental Protection Agency (EPA).

What is lead?

Lead is a naturally occurring bluish-gray metal found in small amounts in the earth's crust. Lead can be found in all parts of our environment. Much of it comes from human activities including burning fossil fuels, mining, and manufacturing.

Lead has many different uses. It is used in the production of batteries, ammunition, metal products (solder and pipes), and devices to shield X-rays. Because of health concerns, lead from gasoline, paints and ceramic products, caulking, and pipe solder has been dramatically reduced in recent years.

What happens to lead when it enters the environment?

- Lead itself does not break down, but lead compounds are changed by sunlight, air, and water.
- When lead is released to the air, it may travel long distances before settling to the ground.
- Once lead falls onto soil, it usually sticks to soil particles.
- Movement of lead from soil into groundwater will depend on the type of lead compound and the characteristics of the soil.

How might I be exposed to lead?

- Eating food or drinking water that contains lead. Water pipes in some older homes may contain lead solder. Lead can leach out into the water.
- Spending time in areas where lead-based paints have been used and are deteriorating. Deteriorating lead paint can contribute to lead dust.
- Working in a job where lead is used or engaging in certain hobbies in which lead is used, such stained glass.
- Using health-care products or folk remedies that contain lead.

How can lead affect my health?

The effects of lead are the same whether it enters the body through breathing or swallowing. Lead can affect almost every organ and system in your body. The main target for lead toxicity is the nervous system, both in adults and children. Long-term exposure of adults can result in decreased performance in some tests that measure functions of the nervous system. It may also cause weakness in fingers, wrists, or ankles. Lead exposure also causes small increases in blood pressure, particularly in middle-aged and older people and can cause anemia. Exposure to high lead levels can severely damage the brain and kidneys in adults or children and ultimately cause death. In pregnant women, high levels of exposure to lead may cause miscarriage. High-level exposure in men can damage the organs responsible for sperm production.

How likely is lead to cause cancer?

We have no conclusive proof that lead causes cancer in humans. Kidney tumors have developed in rats and mice that had been given large doses of some kind of lead compounds. The Department of Health and Human Services (DHHS) has determined that lead and lead compounds are reasonably anticipated to be human carcinogens and the EPA has determined that lead is a probable human carcinogen. The International Agency for Research on

Cancer (IARC) has determined that inorganic lead is probably carcinogenic to humans and that there is insufficient information to determine whether organic lead compounds will cause cancer in humans.

How can lead affect children?

Small children can be exposed by eating lead-based paint chips, chewing on objects painted with lead-based paint, or swallowing house dust or soil that contains lead.

Children are more vulnerable to lead poisoning than adults. A child who swallows large amounts of lead may develop blood anemia, severe stomachache, muscle weakness, and brain damage. If a child swallows smaller amounts of lead, much less severe effects on blood and brain function may occur. Even at much lower levels of exposure, lead can affect a child's mental and physical growth.

Exposure to lead is more dangerous for young and unborn children. Unborn children can be exposed to lead through their mothers. Harmful effects include premature births, smaller babies, decreased mental ability in the infant, learning difficulties, and reduced growth in young children. These effects are more common if the mother or baby was exposed to high levels of lead. Some of these effects may persist beyond childhood.

How can families reduce the risks of exposure to lead?

- ❑ Avoid exposure to sources of lead.
- ❑ Do not allow children to chew or mouth painted surfaces that may have been painted with lead-based paint.
- ❑ If you have a water lead problem, run or flush water that has been standing overnight before drinking or cooking with it.
- ❑ Some types of paints and pigments that are used as make-up or hair coloring contain lead. Keep these kinds of products away from children
- ❑ If your home contains lead-based paint or you live in an area contaminated with lead, wash children's hands and faces often to remove lead dusts and soil, and regularly clean the house of dust and tracked in soil.

Is there a medical test to determine whether I've been exposed to lead?

A blood test is available to measure the amount of lead in your blood and to estimate the amount of your recent exposure to lead. Blood tests are commonly used to screen children for lead poisoning. Lead in teeth or bones can be measured by X-ray techniques, but these methods are not widely available. Exposure to lead also can be evaluated by measuring erythrocyte protoporphyrin (EP) in blood samples. EP is a part of red blood cells known to increase when the amount of lead in the blood is high. However, the EP level is not sensitive enough to identify children with elevated blood lead levels below about 25 micrograms per deciliter (µg/dL). These tests usually require special analytical equipment that is not available in a doctor's office. However, your doctor can draw blood samples and send them to appropriate laboratories for analysis.

Has the federal government made recommendations to protect human health?

The Centers for Disease Control and Prevention (CDC) recommends that states test children at ages 1 and 2 years. Children should be tested at ages 3-6 years if they have never been tested for lead, if they receive services from public assistance programs for the poor such as Medicaid or the Supplemental Food Program for Women, Infants, and Children, if they live in a building or frequently visit a house built before 1950; if they visit a home (house or apartment) built before 1978 that has been recently remodeled; and/or if they have a brother, sister, or playmate who has had lead poisoning. CDC considers a lead level of 10 µg/dL to be a level of concern for children.

EPA limits lead in drinking water to 15 µg per liter.

References

Agency for Toxic Substances and Disease Registry (ATSDR). 2005. Toxicological Profile for lead (Draft for Public Comment). Atlanta, GA: U.S. Department of Public Health and Human Services, Public Health Service.

Where can I get more information? For more information, contact the Agency for Toxic Substances and Disease Registry, Division of Toxicology and Environmental Medicine, 1600 Clifton Road NE, Mailstop F-32, Atlanta, GA 30333. Phone: 1-888-422-8737, FAX: 770-488-4178. ToxFAQs Internet address via WWW is http://www.atsdr.cdc.gov/toxfaq.html. ATSDR can tell you where to find occupational and environmental health clinics. Their specialists can recognize, evaluate, and treat illnesses resulting from exposure to hazardous substances. You can also contact your community or state health or environmental quality department if you have any more questions or concerns.

ATSDR
AGENCY FOR TOXIC SUBSTANCES AND DISEASE REGISTRY

ARSENIC
CAS # 7440-38-2

Division of Toxicology and Environmental Medicine ToxFAQs™ August 2007

This fact sheet answers the most frequently asked health questions (FAQs) about arsenic. For more information, call the ATSDR Information Center at 1-800-232-4636. This fact sheet is one in a series of summaries about hazardous substances and their health effects. It is important you understand this information because this substance may harm you. The effects of exposure to any hazardous substance depend on the dose, the duration, how you are exposed, personal traits and habits, and whether other chemicals are present.

HIGHLIGHTS: Exposure to higher than average levels of arsenic occur mostly in the workplace, near hazardous waste sites, or in areas with high natural levels. At high levels, inorganic arsenic can cause death. Exposure to lower levels for a long time can cause a discoloration of the skin and the appearance of small corns or warts. Arsenic has been found in at least 1,149 of the 1,684 National Priority List sites identified by the Environmental Protection Agency (EPA).

What is arsenic?

Arsenic is a naturally occurring element widely distributed in the earth's crust. In the environment, arsenic is combined with oxygen, chlorine, and sulfur to form inorganic arsenic compounds. Arsenic in animals and plants combines with carbon and hydrogen to form organic arsenic compounds.

Inorganic arsenic compounds are mainly used to preserve wood. Copper chromated arsenate (CCA) is used to make "pressure-treated" lumber. CCA is no longer used in the U.S. for residential uses; it is still used in industrial applications. Organic arsenic compounds are used as pesticides, primarily on cotton fields and orchards.

What happens to arsenic when it enters the environment?

- Arsenic occurs naturally in soil and minerals and may enter the air, water, and land from wind-blown dust and may get into water from runoff and leaching.
- Arsenic cannot be destroyed in the environment. It can only change its form.
- Rain and snow remove arsenic dust particles from the air.
- Many common arsenic compounds can dissolve in water. Most of the arsenic in water will ultimately end up in soil or sediment.
- Fish and shellfish can accumulate arsenic; most of this arsenic is in an organic form called arsenobetaine that is much less harmful.

How might I be exposed to arsenic?

- Ingesting small amounts present in your food and water or breathing air containing arsenic.
- Breathing sawdust or burning smoke from wood treated with arsenic.
- Living in areas with unusually high natural levels of arsenic in rock.
- Working in a job that involves arsenic production or use, such as copper or lead smelting, wood treating, or pesticide application.

How can arsenic affect my health?

Breathing high levels of inorganic arsenic can give you a sore throat or irritated lungs.

Ingesting very high levels of arsenic can result in death. Exposure to lower levels can cause nausea and vomiting, decreased production of red and white blood cells, abnormal heart rhythm, damage to blood vessels, and a sensation of "pins and needles" in hands and feet.

Ingesting or breathing low levels of inorganic arsenic for a long time can cause a darkening of the skin and the appearance of small "corns" or "warts" on the palms, soles, and torso.

Skin contact with inorganic arsenic may cause redness and swelling.

Almost nothing is known regarding health effects of organic arsenic compounds in humans. Studies in animals show that some simple organic arsenic compounds are less toxic than inorganic forms. Ingestion of methyl and dimethyl compounds can cause diarrhea and damage to the kidneys

How likely is arsenic to cause cancer?

Several studies have shown that ingestion of inorganic arsenic can increase the risk of skin cancer and cancer in the liver, bladder, and lungs. Inhalation of inorganic arsenic can cause increased risk of lung cancer. The Department of Health and Human Services (DHHS) and the EPA have determined that inorganic arsenic is a known human carcinogen. The International Agency for Research on Cancer (IARC) has determined that inorganic arsenic is carcinogenic to humans.

How can arsenic affect children?

There is some evidence that long-term exposure to arsenic in children may result in lower IQ scores. There is also some evidence that exposure to arsenic in the womb and early childhood may increase mortality in young adults.

There is some evidence that inhaled or ingested arsenic can injure pregnant women or their unborn babies, although the studies are not definitive. Studies in animals show that large doses of arsenic that cause illness in pregnant females, can also cause low birth weight, fetal malformations, and even fetal death. Arsenic can cross the placenta and has been found in fetal tissues. Arsenic is found at low levels in breast milk.

How can families reduce the risks of exposure to arsenic?

❑ If you use arsenic-treated wood in home projects, you should wear dust masks, gloves, and protective clothing to decrease exposure to sawdust.

❑ If you live in an area with high levels of arsenic in water or soil, you should use cleaner sources of water and limit contact with soil.

❑ If you work in a job that may expose you to arsenic, be aware that you may carry arsenic home on your clothing, skin, hair, or tools. Be sure to shower and change clothes before going home.

Is there a medical test to determine whether I've been exposed to arsenic?

There are tests available to measure arsenic in your blood, urine, hair, and fingernails. The urine test is the most reliable test for arsenic exposure within the last few days. Tests on hair and fingernails can measure exposure to high levels of arsenic over the past 6-12 months. These tests can determine if you have been exposed to above-average levels of arsenic. They cannot predict whether the arsenic levels in your body will affect your health.

Has the federal government made recommendations to protect human health?

The EPA has set limits on the amount of arsenic that industrial sources can release to the environment and has restricted or cancelled many of the uses of arsenic in pesticides. EPA has set a limit of 0.01 parts per million (ppm) for arsenic in drinking water.

The Occupational Safety and Health Administration (OSHA) has set a permissible exposure limit (PEL) of 10 micrograms of arsenic per cubic meter of workplace air (10 $\mu g/m^3$) for 8 hour shifts and 40 hour work weeks.

References

Agency for Toxic Substances and Disease Registry (ATSDR). 2007. Toxicological Profile for Arsenic (Update). Atlanta, GA: U.S. Department of Public Health and Human Services, Public Health Service.

Where can I get more information? For more information, contact the Agency for Toxic Substances and Disease Registry, Division of Toxicology and Environmental Medicine, 1600 Clifton Road NE, Mailstop F-32, Atlanta, GA 30333. Phone: 1-800-232-4636, FAX: 770-488-4178. ToxFAQs Internet address via WWW is http://www.atsdr.cdc.gov/toxfaq.html. ATSDR can tell you where to find occupational and environmental health clinics. Their specialists can recognize, evaluate, and treat illnesses resulting from exposure to hazardous substances. You can also contact your community or state health or environmental quality department if you have any more questions or concerns.

ATSDR
AGENCY FOR TOXIC SUBSTANCES AND DISEASE REGISTRY

CADMIUM

CAS # 7440-43-9

Division of Toxicology and Environmental Medicine ToxFAQs™ September 2008

This fact sheet answers the most frequently asked health questions (FAQs) about cadmium. For more information, call the ATSDR Information Center at 1-800-232-4636. This fact sheet is one in a series of summaries about hazardous substances and their health effects. It is important you understand this information because this substance may harm you. The effects of exposure to any hazardous substance depend on the dose, the duration, how you are exposed, personal traits and habits, and whether other chemicals are present.

HIGHLIGHTS: Exposure to cadmium happens mostly in the workplace where cadmium products are made. The general population is exposed from breathing cigarette smoke or eating cadmium contaminated foods. Cadmium damages the kidneys, lungs, and bones. Cadmium has been found in at least 1,014 of the 1,669 National Priorities List sites identified by the Environmental Protection Agency (EPA).

What is cadmium?

Cadmium is a natural element in the earth's crust. It is usually found as a mineral combined with other elements such as oxygen (cadmium oxide), chlorine (cadmium chloride), or sulfur (cadmium sulfate, cadmium sulfide).

All soils and rocks, including coal and mineral fertilizers, contain some cadmium. Most cadmium used in the United States is extracted during the production of other metals like zinc, lead, and copper. Cadmium does not corrode easily and has many uses, including batteries, pigments, metal coatings, and plastics.

What happens to cadmium when it enters the environment?

- ❑ Cadmium enters soil, water, and air from mining, industry, and burning coal and household wastes.
- ❑ Cadmium does not break down in the environment, but can change forms.
- ❑ Cadmium particles in air can travel long distances before falling to the ground or water.
- ❑ Some forms of cadmium dissolve in water.
- ❑ Cadmium binds strongly to soil particles.
- ❑ Fish, plants, and animals take up cadmium from the environment.

How might I be exposed to cadmium?

- ❑ Eating foods containing cadmium; low levels are found in all foods (highest levels are found in shellfish, liver, and kidney meats).
- ❑ Smoking cigarettes or breathing cigarette smoke.
- ❑ Breathing contaminated workplace air.
- ❑ Drinking contaminated water.
- ❑ Living near industrial facilities which release cadmium into the air.

How can cadmium affect my health?

Breathing high levels of cadmium can severely damage the lungs. Eating food or drinking water with very high levels severely irritates the stomach, leading to vomiting and diarrhea.

Long-term exposure to lower levels of cadmium in air, food, or water leads to a buildup of cadmium in the kidneys and possible kidney disease. Other long-term effects are lung damage and fragile bones.

How likely is cadmium to cause cancer?

The Department of Health and Human Services (DHHS) has determined that cadmium and cadmium compounds are known human carcinogens.

How can cadmium affect children?

The health effects in children are expected to be similar to the effects seen in adults (kidney, lung, and bone damage depending on the route of exposure).

A few studies in animals indicate that younger animals absorb more cadmium than adults. Animal studies also indicate that the young are more susceptible than adults to a loss of bone and decreased bone strength from exposure to cadmium.

We don't know if cadmium causes birth defects in people. The babies of animals exposed to high levels of cadmium during pregnancy had changes in behavior and learning ability. There is also some information from animal studies that high enough exposures to cadmium before birth can reduce body weights and affect the skeleton in the developing young.

How can families reduce the risks of exposure to cadmium?

- In the home, store substances that contain cadmium safely, and keep nickel-cadmium batteries out of reach of young children.
- Cadmium is a component of tobacco smoke. Avoid smoking in enclosed spaces like inside the home or car in order to limit exposure to children and other family members.
- If you work with cadmium, use all safety precautions to avoid carrying cadmium-containing dust home from work on your clothing, skin, hair, or tools.
- A balanced diet can reduce the amount of cadmium taken into the body from food and drink.

Is there a medical test to determine whether I've been exposed to cadmium?

Cadmium can be measured in blood, urine, hair, or nails. Urinary cadmium has been shown to accurately reflect the amount of cadmium in the body.

The amount of cadmium in your blood shows your recent exposure to cadmium. The amount of cadmium in your urine shows both your recent and your past exposure.

Has the federal government made recommendations to protect human health?

The EPA has determined that exposure to cadmium in drinking water at concentrations of 0.04 ppm for up to 10 days is not expected to cause any adverse effects in a child.

The EPA has determined that lifetime exposure to 0.005 ppm cadmium is not expected to cause any adverse effects.

The FDA has determined that the cadmium concentration in bottled drinking water should not exceed 0.005 ppm.

The Occupational Health and Safety Administration (OSHA) has limited workers' exposure to an average of 5 $\mu g/m^3$ for an 8-hour workday, 40-hour workweek.

References

Agency for Toxic Substances and Disease Registry (ATSDR). 2008. Toxicological Profile for Cadmium (Draft for Public Comment). Atlanta, GA: U.S. Department of Public Health and Human Services, Public Health Service.

Where can I get more information? For more information, contact the Agency for Toxic Substances and Disease Registry, Division of Toxicology and Environmental Medicine, 1600 Clifton Road NE, Mailstop F-32, Atlanta, GA 30333. Phone: 1-800-232-4636, FAX: 770-488-4178. ToxFAQs Internet address via WWW is http://www.atsdr.cdc.gov/toxfaq.html. ATSDR can tell you where to find occupational and environmental health clinics. Their specialists can recognize, evaluate, and treat illnesses resulting from exposure to hazardous substances. You can also contact your community or state health or environmental quality department if you have any more questions or concerns.

ATSDR
AGENCY FOR TOXIC SUBSTANCES AND DISEASE REGISTRY

ZINC

CAS # 7440-66-6

Division of Toxicology ToxFAQs™ August 2005

This fact sheet answers the most frequently asked health questions (FAQs) about zinc. For more information, call the ATSDR Information Center at 1-888-422-8737. This fact sheet is one in a series of summaries about hazardous substances and their health effects. It is important you understand this information because this substance may harm you. The effects of exposure to any hazardous substance depend on the dose, the duration, how you are exposed, personal traits and habits, and whether other chemicals are present.

HIGHLIGHTS: Zinc is a naturally occurring element. Exposure to high levels of zinc occurs mostly from eating food, drinking water, or breathing workplace air that is contaminated. Low levels of zinc are essential for maintaining good health. Exposure to large amounts of zinc can be harmful. It can cause stomach cramps, anemia, and changes in cholesterol levels. Zinc has been found in at least 985 of the 1,662 National Priority List sites identified by the Environmental Protection Agency (EPA).

What is zinc?

Zinc is one of the most common elements in the earth's crust. It is found in air, soil, and water, and is present in all foods. Pure zinc is a bluish-white shiny metal.

Zinc has many commercial uses as coatings to prevent rust, in dry cell batteries, and mixed with other metals to make alloys like brass, and bronze. A zinc and copper alloy is used to make pennies in the United States.

Zinc combines with other elements to form zinc compounds. Common zinc compounds found at hazardous waste sites include zinc chloride, zinc oxide, zinc sulfate, and zinc sulfide. Zinc compounds are widely used in industry to make paint, rubber, dyes, wood preservatives, and ointments.

What happens to zinc when it enters the environment?

- Some is released into the environment by natural processes, but most comes from human activities like mining, steel production, coal burning, and burning of waste.
- It attaches to soil, sediments, and dust particles in the air.
- Rain and snow remove zinc dust particles from the air.
- Depending on the type of soil, some zinc compounds can move into the groundwater and into lakes, streams, and rivers.
- Most of the zinc in soil stays bound to soil particles and does not dissolve in water.
- It builds up in fish and other organisms, but it does not build up in plants.

How might I be exposed to zinc?

- Ingesting small amounts present in your food and water.
- Drinking contaminated water or a beverage that has been stored in metal containers or flows through pipes that have been coated with zinc to resist rust.
- Eating too many dietary supplements that contain zinc.
- Working on any of the following jobs: construction, painting, automobile mechanics, mining, smelting, and welding; manufacture of brass, bronze, or other zinc-containing alloys; manufacture of galvanized metals; and manufacture of machine parts, rubber, paint, linoleum, oilcloths, batteries, some kind of glass, ceramics, and dyes.

How can zinc affect my health?

Zinc is an essential element in our diet. Too little zinc can cause problems, but too much zinc is also harmful.

Harmful effects generally begin at levels 10-15 times higher than the amount needed for good health. Large doses taken by mouth even for a short time can cause stomach cramps, nausea, and vomiting. Taken longer, it can cause anemia and decrease the levels of your good cholesterol. We do not know if high levels of zinc affect reproduction in humans. Rats that were fed large amounts of zinc became infertile.

Inhaling large amounts of zinc (as dusts or fumes) can cause a specific short-term disease called metal fume fever. We do not know the long-term effects of breathing high levels of zinc.

Putting low levels of zinc acetate and zinc chloride on the skin of rabbits, guinea pigs, and mice caused skin irritation. Skin irritation will probably occur in people.

How likely is zinc to cause cancer?

The Department of Health and Human Services (DHHS) and the International Agency for Research on Cancer (IARC) have not classified zinc for carcinogenicity. Based on incomplete information from human and animal studies, the EPA has determined that zinc is not classifiable as to its human carcinogenicity.

How can zinc affect children?

Zinc is essential for proper growth and development of young children. It is likely that children exposed to very high levels of zinc will have similar effects as adults. We do not know whether children are more susceptible to the effects of excessive intake of zinc than the adults.

We do not know if excess zinc can cause developmental effects in humans. Animal studies have found decreased weight in the offspring of animals that ingested very high amounts of zinc.

How can families reduce the risks of exposure to zinc?

- Children living near waste sites that contain zinc may be exposed to higher levels of zinc through breathing contaminated air, drinking contaminated drinking water, touching or eating contaminated soil.
- Discourage your children from eating soil or putting their hands in their mouths and teach them to wash their hands frequently and before eating.
- If you use medicines or vitamin supplements containing zinc, make sure you use them appropriately and keep them out of the reach of children.

Is there a medical test to determine whether I've been exposed to zinc?

There are tests available to measure zinc in your blood, urine, hair, saliva, and feces. These tests are not usually done in the doctor's office because they require special equipment. High levels of zinc in the feces can mean high recent zinc exposure. High levels of zinc in the blood can mean high zinc consumption and/or high exposure. Tests to measure zinc in hair may provide information on long-term zinc exposure; however, the relationship between levels in your hair and the amount of zinc you were exposed to is not clear.

Has the federal government made recommendations to protect human health?

The EPA recommends that drinking water should contain no more than 5 milligrams per liter of water (5 mg/L) because of taste. The EPA requires that any release of 1,000 pounds (or in some cases 5,000 pounds) into the environment be reported to the agency.

To protect workers, the Occupational Safety and Health Administration (OSHA) has set an average limit of 1 mg/m^3 for zinc chloride fumes and 5 mg/m^3 for zinc oxide (dusts and fumes) in workplace air during an 8-hour workday, 40-hour workweek.

Similarly, the National Institute for Occupational Safety and Health (NIOSH) has set the same standards for up to a 10-hour workday over a 40-hour workweek.

References

Agency for Toxic Substances and Disease Registry (ATSDR). 2005. Toxicological Profile for Zinc (Update). Atlanta, GA: U.S. Department of Public Health and Human Services, Public Health Service.

Where can I get more information? For more information, contact the Agency for Toxic Substances and Disease Registry, Division of Toxicology, 1600 Clifton Road NE, Mailstop F-32, Atlanta, GA 30333. Phone: 1-888-422-8737, FAX: 770-488-4178. ToxFAQs Internet address via WWW is http://www.atsdr.cdc.gov/toxfaq.html. ATSDR can tell you where to find occupational and environmental health clinics. Their specialists can recognize, evaluate, and treat illnesses resulting from exposure to hazardous substances. You can also contact your community or state health or environmental quality department if you have any more questions or concerns.

Memo From: Barry Evans, EPA Lab
Telephone: (913) 551-5144

HRS Analysis Results Supplement

07/30/2012

ASR Number: 3001

This report supplements the information contained in the Transmittal of Sample Analysis Results for ASR 3001 sent to Eddie McGlasson on 06/07/2006 for: EMA78Q00 - United Zinc No. 1 site sampling. The transmittal contains the explanation of codes, units, and qualifiers; sample information; analysis information and comments; and the analytical results. The RL in this supplement is the laboratory's reporting limit for that analyte with any dilution factor, volume adjustment, or percent solids for that sample analysis taken into account and is sometimes called the sample quantitation limit, SQL.

Sample	Analysis / Analyte		Units	Result	RL
1-__	1	Metals in Solids by ICP-AES			
		Barium	mg/kg	117	2.78
		Arsenic	mg/kg	8.75	6.96
		Zinc	mg/kg	1340 J	6.96
		Cadmium	mg/kg	7.81	1.39
		Lead	mg/kg	585	6.96
1-__	1	Percent Solid			
		Solids, percent	%	67.8	
2-__	1	Metals in Solids by ICP-AES			
		Barium	mg/kg	139	2.32
		Lead	mg/kg	596	5.80
		Cadmium	mg/kg	4.42	1.16
		Zinc	mg/kg	851	5.80
		Arsenic	mg/kg	7.82	5.80
2-__	1	Percent Solid			
		Solids, percent	%	81.4	
2-FD	1	Metals in Solids by ICP-AES			
		Lead	mg/kg	496	5.72
		Cadmium	mg/kg	4.09	1.14
		Barium	mg/kg	142	2.29
		Zinc	mg/kg	841	5.72
		Arsenic	mg/kg	5.38	5.72
2-FD	1	Percent Solid			
		Solids, percent	%	80.9	
4-__	1	Metals in Solids by ICP-AES			
		Barium	mg/kg	177	2.26
		Arsenic	mg/kg	13.4	5.65
		Zinc	mg/kg	1550	5.65
		Cadmium	mg/kg	9.02	1.13
		Lead	mg/kg	501	5.65
4-__	1	Percent Solid			
		Solids, percent	%	88.5	

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Memo From: Barry Evans, EPA Lab
Telephone: (913) 551-5144

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Sample	Analysis / Analyte	Units	Result	RL
5-__	1 Metals in Solids by ICP-AES			
	Barium	mg/kg	125	2.14
	Arsenic	mg/kg	8.86	5.34
	Zinc	mg/kg	472	5.34
	Cadmium	mg/kg	4.38	1.07
	Lead	mg/kg	263	5.34
5-__	1 Percent Solid			
	Solids, percent	%	90.0	
6-__	1 Metals in Solids by ICP-AES			
	Barium	mg/kg	133	2.14
	Arsenic	mg/kg	5.47	5.35
	Zinc	mg/kg	836	5.35
	Cadmium	mg/kg	5.05	1.07
	Lead	mg/kg	284	5.35
6-__	1 Percent Solid			
	Solids, percent	%	89.8	
7-__	1 Metals in Solids by ICP-AES			
	Barium	mg/kg	161	2.07
	Arsenic	mg/kg	6.46	5.17
	Zinc	mg/kg	684	5.17
	Cadmium	mg/kg	5.84	1.03
	Lead	mg/kg	223	5.17
7-__	1 Percent Solid			
	Solids, percent	%	93.8	
8-__	1 Metals in Solids by ICP-AES			
	Barium	mg/kg	150	2.03
	Arsenic	mg/kg	4.71	5.07
	Zinc	mg/kg	536	5.07
	Cadmium	mg/kg	4.40	1.01
	Lead	mg/kg	210	5.07
8-__	1 Percent Solid			
	Solids, percent	%	91.3	
9-__	1 Metals in Solids by ICP-AES			
	Barium	mg/kg	139	2.39
	Arsenic	mg/kg	11.0	5.98
	Zinc	mg/kg	1740	5.98
	Cadmium	mg/kg	10.3	1.20
	Lead	mg/kg	961	5.98
9-__	1 Percent Solid			
	Solids, percent	%	78.9	
10-__	1 Metals in Solids by ICP-AES			
	Barium	mg/kg	172	2.35

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Sample	Analysis / Analyte		Units	Result	RL
10-__	1	Metals in Solids by ICP-AES			
		Arsenic	mg/kg	5.42	5.88
		Zinc	mg/kg	677	5.88
		Cadmium	mg/kg	6.92	1.18
		Lead	mg/kg	228	5.88
10-__	1	Percent Solid			
		Solids, percent	%	84.3	
11-__	1	Metals in Solids by ICP-AES			
		Barium	mg/kg	144	2.46
		Arsenic	mg/kg	7.47	6.16
		Zinc	mg/kg	3090	6.16
		Cadmium	mg/kg	31.5	1.23
		Lead	mg/kg	736	6.16
11-__	1	Percent Solid			
		Solids, percent	%	81.2	
12-__	1	Metals in Solids by ICP-AES			
		Barium	mg/kg	184	2.13
		Arsenic	mg/kg	13.5	5.31
		Zinc	mg/kg	1610	5.31
		Cadmium	mg/kg	8.21	1.06
		Lead	mg/kg	806	5.31
12-__	1	Percent Solid			
		Solids, percent	%	90.5	
13-__	1	Metals in Solids by ICP-AES			
		Barium	mg/kg	140	2.36
		Arsenic	mg/kg	108	5.90
		Zinc	mg/kg	2280	5.90
		Cadmium	mg/kg	15.7	1.18
		Lead	mg/kg	869	5.90
13-__	1	Percent Solid			
		Solids, percent	%	84.7	
14-__	1	Metals in Solids by ICP-AES			
		Barium	mg/kg	159	2.05
		Arsenic	mg/kg	10.6	5.14
		Zinc	mg/kg	1420	5.14
		Cadmium	mg/kg	11.2	1.03
		Lead	mg/kg	539	5.14
14-__	1	Percent Solid			
		Solids, percent	%	91.0	
15-__	1	Metals in Solids by ICP-AES			
		Barium	mg/kg	334	2.18
		Arsenic	mg/kg	6.55	5.45

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Sample	Analysis / Analyte		Units	Result	RL
15-__	1	Metals in Solids by ICP-AES			
		Zinc	mg/kg	444	5.45
		Cadmium	mg/kg	6.95	1.09
		Lead	mg/kg	135	5.45
15-__	1	Percent Solid			
		Solids, percent	%	90.1	
16-__	1	Metals in Solids by ICP-AES			
		Barium	mg/kg	168	2.07
		Arsenic	mg/kg	11.4	5.19
		Zinc	mg/kg	900	5.19
		Cadmium	mg/kg	6.58	1.04
		Lead	mg/kg	420	5.19
16-__	1	Percent Solid			
		Solids, percent	%	87.7	
17-__	1	Metals in Solids by ICP-AES			
		Barium	mg/kg	149	2.21
		Arsenic	mg/kg	7.30	5.53
		Zinc	mg/kg	1130	5.53
		Cadmium	mg/kg	7.08	1.11
		Lead	mg/kg	434	5.53
17-__	1	Percent Solid			
		Solids, percent	%	83.7	
18-__	1	Metals in Solids by ICP-AES			
		Barium	mg/kg	158	2.41
		Arsenic	mg/kg	12.1	6.02
		Zinc	mg/kg	1690	6.02
		Cadmium	mg/kg	8.97	1.20
		Lead	mg/kg	2290	6.02
18-__	1	Percent Solid			
		Solids, percent	%	79.8	
19-__	1	Metals in Solids by ICP-AES			
		Barium	mg/kg	174	2.12
		Arsenic	mg/kg	7.62	5.31
		Zinc	mg/kg	750	5.31
		Cadmium	mg/kg	6.05	1.06
		Lead	mg/kg	440	5.31
19-__	1	Percent Solid			
		Solids, percent	%	89.7	
20-__	1	Metals in Solids by ICP-AES			
		Barium	mg/kg	196	2.21
		Arsenic	mg/kg	7.44	5.51
		Zinc	mg/kg	1010	5.51

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Sample	Analysis / Analyte	Units	Result	RL
20-__	1 Metals in Solids by ICP-AES			
	Cadmium	mg/kg	7.21	1.10
	Lead	mg/kg	582	5.51
20-__	1 Percent Solid			
	Solids, percent	%	89.7	
21-__	1 Metals in Solids by ICP-AES			
	Barium	mg/kg	257	2.76
	Arsenic	mg/kg	7.37 J	6.90
	Zinc	mg/kg	1160 J	6.90
	Cadmium	mg/kg	8.20	1.38
	Lead	mg/kg	745	6.90
21-__	1 Percent Solid			
	Solids, percent	%	87.3	
22-__	1 Metals in Solids by ICP-AES			
	Barium	mg/kg	159	2.06
	Arsenic	mg/kg	8.40	5.16
	Zinc	mg/kg	1480	5.16
	Cadmium	mg/kg	10.9	1.03
	Lead	mg/kg	571	5.16
22-__	1 Percent Solid			
	Solids, percent	%	91.4	
23-__	1 Metals in Solids by ICP-AES			
	Barium	mg/kg	155	2.04
	Arsenic	mg/kg	10.1	5.10
	Zinc	mg/kg	1600	5.10
	Cadmium	mg/kg	12.2	1.02
	Lead	mg/kg	681	5.10
23-__	1 Percent Solid			
	Solids, percent	%	93.3	
24-__	1 Metals in Solids by ICP-AES			
	Barium	mg/kg	168	2.38
	Arsenic	mg/kg	11.7	5.95
	Zinc	mg/kg	985	5.95
	Cadmium	mg/kg	8.00	1.19
	Lead	mg/kg	567	5.95
24-__	1 Percent Solid			
	Solids, percent	%	81.6	
25-__	1 Metals in Solids by ICP-AES			
	Barium	mg/kg	140	2.16
	Arsenic	mg/kg	19.2	5.39
	Zinc	mg/kg	1730	5.39
	Cadmium	mg/kg	9.74	1.08

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Sample	Analysis / Analyte		Units	Result	RL
25-__	1	Metals in Solids by ICP-AES			
		Lead	mg/kg	1040	5.39
25-__	1	Percent Solid			
		Solids, percent	%	89.1	
26-__	1	Metals in Solids by ICP-AES			
		Barium	mg/kg	162	2.66
		Arsenic	mg/kg	21.0	6.64
		Zinc	mg/kg	1470	6.64
		Cadmium	mg/kg	8.26	1.33
		Lead	mg/kg	769	6.64
26-__	1	Percent Solid			
		Solids, percent	%	71.0	
27-__	1	Metals in Solids by ICP-AES			
		Barium	mg/kg	160	2.86
		Arsenic	mg/kg	7.46	7.16
		Zinc	mg/kg	1180	7.16
		Cadmium	mg/kg	9.53	1.43
		Lead	mg/kg	1050	7.16
27-__	1	Percent Solid			
		Solids, percent	%	68.5	
28-__	1	Metals in Solids by ICP-AES			
		Barium	mg/kg	149	2.61
		Arsenic	mg/kg	14.8	6.52
		Zinc	mg/kg	2140	6.52
		Cadmium	mg/kg	8.37	1.30
		Lead	mg/kg	1150	6.52
28-__	1	Percent Solid			
		Solids, percent	%	72.3	
29-__	1	Metals in Solids by ICP-AES			
		Barium	mg/kg	128	2.74
		Arsenic	mg/kg	5.30	6.86
		Zinc	mg/kg	1140	6.86
		Cadmium	mg/kg	7.92	1.37
		Lead	mg/kg	490	6.86
29-__	1	Percent Solid			
		Solids, percent	%	69.4	
30-__	1	Metals in Solids by ICP-AES			
		Barium	mg/kg	99.4	2.47
		Arsenic	mg/kg	7.91	6.19
		Zinc	mg/kg	852	6.19
		Cadmium	mg/kg	8.92	1.24
		Lead	mg/kg	246	6.19

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Sample	Analysis / Analyte		Units	Result	RL
30-__	1	Percent Solid			
		Solids, percent	%	75.5	
31-__	1	Metals in Solids by ICP-AES			
		Barium	mg/kg	130	2.52
		Arsenic	mg/kg	7.85	6.31
		Zinc	mg/kg	833	6.31
		Cadmium	mg/kg	7.01	1.26
		Lead	mg/kg	288	6.31
31-__	1	Percent Solid			
		Solids, percent	%	73.4	
32-__	1	Metals in Solids by ICP-AES			
		Barium	mg/kg	152	2.36
		Arsenic	mg/kg	17.9	5.91
		Zinc	mg/kg	2400	5.91
		Cadmium	mg/kg	17.3	1.18
		Lead	mg/kg	1200	5.91
32-__	1	Percent Solid			
		Solids, percent	%	76.9	
33-__	1	Metals in Solids by ICP-AES			
		Barium	mg/kg	175	3.09
		Arsenic	mg/kg	10.3	7.72
		Zinc	mg/kg	1310	7.72
		Cadmium	mg/kg	7.52	1.54
		Lead	mg/kg	704	7.72
33-__	1	Percent Solid			
		Solids, percent	%	62.9	
34-__	1	Metals in Solids by ICP-AES			
		Barium	mg/kg	136	2.50
		Arsenic	mg/kg	8.01	6.24
		Zinc	mg/kg	745	6.24
		Cadmium	mg/kg	6.35	1.25
		Lead	mg/kg	556	6.24
34-__	1	Percent Solid			
		Solids, percent	%	74.2	
35-__	1	Metals in Solids by ICP-AES			
		Barium	mg/kg	142	2.44
		Arsenic	mg/kg	7.51	6.09
		Zinc	mg/kg	1150	6.09
		Cadmium	mg/kg	9.05	1.22
		Lead	mg/kg	417	6.09
35-__	1	Percent Solid			
		Solids, percent	%	76.0	

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Sample	Analysis / Analyte	Units	Result	RL
36-__	1 Metals in Solids by ICP-AES			
	Barium	mg/kg	187	2.58
	Arsenic	mg/kg	5 U	6.45
	Zinc	mg/kg	1140	6.45
	Cadmium	mg/kg	7.68	1.29
	Lead	mg/kg	284	6.45
36-__	1 Percent Solid			
	Solids, percent	%	73.9	
37-__	1 Metals in Solids by ICP-AES			
	Barium	mg/kg	163	2.70
	Arsenic	mg/kg	7.66	6.76
	Zinc	mg/kg	1080	6.76
	Cadmium	mg/kg	7.69	1.35
	Lead	mg/kg	616	6.76
37-__	1 Percent Solid			
	Solids, percent	%	71.8	
38-__	1 Metals in Solids by ICP-AES			
	Barium	mg/kg	129	2.73
	Arsenic	mg/kg	5 U	6.83
	Zinc	mg/kg	762	6.83
	Cadmium	mg/kg	4.68	1.37
	Lead	mg/kg	246	6.83
38-__	1 Percent Solid			
	Solids, percent	%	69.8	
39-__	1 Metals in Solids by ICP-AES			
	Barium	mg/kg	139	2.54
	Arsenic	mg/kg	6.70	6.35
	Zinc	mg/kg	766	6.35
	Cadmium	mg/kg	8.16	1.27
	Lead	mg/kg	209	6.35
39-__	1 Percent Solid			
	Solids, percent	%	73.6	
40-__	1 Metals in Solids by ICP-AES			
	Barium	mg/kg	127	3.09
	Arsenic	mg/kg	9.94	7.73
	Zinc	mg/kg	1860	7.73
	Cadmium	mg/kg	9.23	1.55
	Lead	mg/kg	578	7.73
40-__	1 Percent Solid			
	Solids, percent	%	61.6	
41-__	1 Metals in Solids by ICP-AES			
	Barium	mg/kg	150	2.58

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Sample	Analysis / Analyte	Units	Result	RL
41-__	1 Metals in Solids by ICP-AES			
	Arsenic	mg/kg	14.8	6.45
	Zinc	mg/kg	1210 J	6.45
	Cadmium	mg/kg	6.74	1.29
	Lead	mg/kg	798 J	6.45
41-__	1 Percent Solid			
	Solids, percent	%	69.8	
42-__	1 Metals in Solids by ICP-AES			
	Barium	mg/kg	172	0.721
	Arsenic	mg/kg	6.09	1.80
	Zinc	mg/kg	1020	1.80
	Cadmium	mg/kg	8.84	0.361
	Lead	mg/kg	249	1.80
42-__	1 Percent Solid			
	Solids, percent	%	71.2	
43-__	1 Metals in Solids by ICP-AES			
	Arsenic	mg/kg	3.96	6.41
	Barium	mg/kg	198	2.57
	Cadmium	mg/kg	5.47	1.28
	Lead	mg/kg	106	6.41
	Zinc	mg/kg	483	6.41
43-__	1 Percent Solid			
	Solids, percent	%	70.2	
44-__	1 Metals in Solids by ICP-AES			
	Barium	mg/kg	190	2.31
	Arsenic	mg/kg	6.86	5.78
	Zinc	mg/kg	515	5.78
	Cadmium	mg/kg	5.65	1.16
	Lead	mg/kg	148	5.78
44-__	1 Percent Solid			
	Solids, percent	%	82.5	
45-__	1 Metals in Solids by ICP-AES			
	Barium	mg/kg	150	2.51
	Arsenic	mg/kg	8.20	6.29
	Zinc	mg/kg	1090	6.29
	Cadmium	mg/kg	11.0	1.26
	Lead	mg/kg	342	6.29
45-__	1 Percent Solid			
	Solids, percent	%	75.8	
46-__	1 Metals in Solids by ICP-AES			
	Barium	mg/kg	172	2.47
	Arsenic	mg/kg	5.43	6.16

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Sample	Analysis / Analyte	Units	Result	RL
46-__	1 Metals in Solids by ICP-AES			
	Zinc	mg/kg	588	6.16
	Cadmium	mg/kg	6.12	1.23
	Lead	mg/kg	282	6.16
46-__	1 Percent Solid			
	Solids, percent	%	71.8	
47-__	1 Metals in Solids by ICP-AES			
	Barium	mg/kg	126	2.66
	Arsenic	mg/kg	13.2	6.65
	Zinc	mg/kg	1290	6.65
	Cadmium	mg/kg	7.84	1.33
	Lead	mg/kg	530	6.65
47-__	1 Percent Solid			
	Solids, percent	%	67.1	
48-__	1 Metals in Solids by ICP-AES			
	Barium	mg/kg	107	2.86
	Arsenic	mg/kg	7.42	7.16
	Zinc	mg/kg	1120	7.16
	Cadmium	mg/kg	6.80	1.43
	Lead	mg/kg	411	7.16
48-__	1 Percent Solid			
	Solids, percent	%	65.9	
49-__	1 Metals in Solids by ICP-AES			
	Barium	mg/kg	112	2.81
	Arsenic	mg/kg	12.0	7.03
	Zinc	mg/kg	785	7.03
	Cadmium	mg/kg	6.37	1.41
	Lead	mg/kg	336	7.03
49-__	1 Percent Solid			
	Solids, percent	%	65.9	
50-__	1 Metals in Solids by ICP-AES			
	Barium	mg/kg	117	2.45
	Arsenic	mg/kg	5.80	6.12
	Zinc	mg/kg	741	6.12
	Cadmium	mg/kg	5.53	1.22
	Lead	mg/kg	397	6.12
50-__	1 Percent Solid			
	Solids, percent	%	73.7	
51-__	1 Metals in Solids by ICP-AES			
	Barium	mg/kg	107	2.80
	Arsenic	mg/kg	8.04	6.99
	Zinc	mg/kg	2470	6.99

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Sample	Analysis / Analyte		Units	Result	RL
51-__	1	Metals in Solids by ICP-AES			
		Cadmium	mg/kg	27.7	1.40
		Lead	mg/kg	764	6.99
51-__	1	Percent Solid			
		Solids, percent	%	64.4	
52-__	1	Metals in Solids by ICP-AES			
		Barium	mg/kg	129	2.66
		Arsenic	mg/kg	9.28	6.64
		Zinc	mg/kg	1100	6.64
		Cadmium	mg/kg	7.15	1.33
		Lead	mg/kg	562	6.64
52-__	1	Percent Solid			
		Solids, percent	%	71.8	
53-__	1	Metals in Solids by ICP-AES			
		Barium	mg/kg	121	2.99
		Arsenic	mg/kg	7.18	7.47
		Zinc	mg/kg	578	7.47
		Cadmium	mg/kg	6.52	1.49
		Lead	mg/kg	186	7.47
53-__	1	Percent Solid			
		Solids, percent	%	64.3	
54-__	1	Metals in Solids by ICP-AES			
		Barium	mg/kg	114	2.50
		Arsenic	mg/kg	7.55	6.25
		Zinc	mg/kg	1080	6.25
		Cadmium	mg/kg	7.68	1.25
		Lead	mg/kg	504	6.25
54-__	1	Percent Solid			
		Solids, percent	%	69.6	
55-__	1	Metals in Solids by ICP-AES			
		Barium	mg/kg	120	2.92
		Arsenic	mg/kg	5.22	7.30
		Zinc	mg/kg	856	7.30
		Cadmium	mg/kg	7.89	1.46
		Lead	mg/kg	258	7.30
55-__	1	Percent Solid			
		Solids, percent	%	67.2	
56-__	1	Metals in Solids by ICP-AES			
		Barium	mg/kg	180	2.63
		Arsenic	mg/kg	5.27	6.58
		Zinc	mg/kg	1030	6.58
		Cadmium	mg/kg	6.95	1.32

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Sample	Analysis / Analyte	Units	Result	RL
56-__	1 Metals in Solids by ICP-AES			
	Lead	mg/kg	496	6.58
56-__	1 Percent Solid			
	Solids, percent	%	75.2	
57-__	1 Metals in Solids by ICP-AES			
	Barium	mg/kg	117	2.36
	Arsenic	mg/kg	7.36	5.91
	Zinc	mg/kg	1080	5.91
	Cadmium	mg/kg	6.35	1.18
	Lead	mg/kg	494	5.91
57-__	1 Percent Solid			
	Solids, percent	%	81.3	
58-__	1 Metals in Solids by ICP-AES			
	Barium	mg/kg	140	2.43
	Arsenic	mg/kg	8.48	6.08
	Zinc	mg/kg	1040	6.08
	Cadmium	mg/kg	7.03	1.22
	Lead	mg/kg	837	6.08
58-__	1 Percent Solid			
	Solids, percent	%	80.6	
59-__	1 Metals in Solids by ICP-AES			
	Barium	mg/kg	118	2.48
	Arsenic	mg/kg	8.80	6.19
	Zinc	mg/kg	1460	6.19
	Cadmium	mg/kg	7.46	1.24
	Lead	mg/kg	614	6.19
59-__	1 Percent Solid			
	Solids, percent	%	78.3	
60-__	1 Metals in Solids by ICP-AES			
	Barium	mg/kg	200	2.49
	Arsenic	mg/kg	16.2	6.22
	Zinc	mg/kg	1530	6.22
	Cadmium	mg/kg	9.85	1.24
	Lead	mg/kg	872	6.22
60-__	1 Percent Solid			
	Solids, percent	%	78.8	
61-__	1 Metals in Solids by ICP-AES			
	Barium	mg/kg	271	2.16
	Arsenic	mg/kg	6.62	5.40
	Zinc	mg/kg	723 J	5.40
	Cadmium	mg/kg	5.81	1.08
	Lead	mg/kg	362	5.40

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Sample	Analysis / Analyte		Units	Result	RL
61-__	1	Percent Solid			
		Solids, percent	%	86.5	
62-__	1	Metals in Solids by ICP-AES			
		Barium	mg/kg	149	2.31
		Arsenic	mg/kg	9.00	5.78
		Zinc	mg/kg	1010	5.78
		Cadmium	mg/kg	6.75	1.16
		Lead	mg/kg	551	5.78
62-__	1	Percent Solid			
		Solids, percent	%	80.1	
63-__	1	Metals in Solids by ICP-AES			
		Barium	mg/kg	131	2.47
		Arsenic	mg/kg	49.2	6.18
		Zinc	mg/kg	2880	6.18
		Cadmium	mg/kg	14.6	1.24
		Lead	mg/kg	1960	6.18
63-__	1	Percent Solid			
		Solids, percent	%	79.4	
64-__	1	Metals in Solids by ICP-AES			
		Barium	mg/kg	188	2.72
		Arsenic	mg/kg	6.59	6.81
		Zinc	mg/kg	1260	6.81
		Cadmium	mg/kg	9.71	1.36
		Lead	mg/kg	618	6.81
64-__	1	Percent Solid			
		Solids, percent	%	71.3	
65-__	1	Metals in Solids by ICP-AES			
		Barium	mg/kg	7.35	2.29
		Arsenic	mg/kg	7.89	5.73
		Zinc	mg/kg	864	5.73
		Cadmium	mg/kg	5.82	1.15
		Lead	mg/kg	323	5.73
65-__	1	Percent Solid			
		Solids, percent	%	84.7	
66-__	1	Metals in Solids by ICP-AES			
		Barium	mg/kg	127	2.50
		Arsenic	mg/kg	5.10	6.25
		Zinc	mg/kg	1010	6.25
		Cadmium	mg/kg	6.66	1.25
		Lead	mg/kg	386	6.25
66-__	1	Percent Solid			
		Solids, percent	%	76.2	

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Sample	Analysis / Analyte		Units	Result	RL
67-__	1	Metals in Solids by ICP-AES			
		Barium	mg/kg	111	2.32
		Arsenic	mg/kg	7.10	5.79
		Zinc	mg/kg	1590	5.79
		Cadmium	mg/kg	6.86	1.16
		Lead	mg/kg	509	5.79
67-__	1	Percent Solid			
		Solids, percent	%	80.7	
68-__	1	Metals in Solids by ICP-AES			
		Barium	mg/kg	137	2.23
		Arsenic	mg/kg	11.7	5.58
		Zinc	mg/kg	1320	5.58
		Cadmium	mg/kg	7.89	1.12
		Lead	mg/kg	628	5.58
68-__	1	Percent Solid			
		Solids, percent	%	84.6	
69-__	1	Metals in Solids by ICP-AES			
		Arsenic	mg/kg	8.24	5.44
		Barium	mg/kg	155	2.17
		Zinc	mg/kg	935	5.44
		Cadmium	mg/kg	5.76	1.09
		Lead	mg/kg	460	5.44
69-__	1	Percent Solid			
		Solids, percent	%	85.2	
70-__	1	Metals in Solids by ICP-AES			
		Barium	mg/kg	1254	2.27
		Arsenic	mg/kg	16.5	5.67
		Zinc	mg/kg	1240	5.67
		Cadmium	mg/kg	8.04	1.13
		Lead	mg/kg	554	5.67
70-__	1	Percent Solid			
		Solids, percent	%	88.2	
71-__	1	Metals in Solids by ICP-AES			
		Barium	mg/kg	136	2.20
		Arsenic	mg/kg	9.26	5.51
		Zinc	mg/kg	1020	5.51
		Cadmium	mg/kg	5.32	1.10
		Lead	mg/kg	633	5.51
71-__	1	Percent Solid			
		Solids, percent	%	87.3	
72-__	1	Metals in Solids by ICP-AES			
		Barium	mg/kg	151	2.20

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Sample	Analysis / Analyte		Units	Result	RL
72-__	1	Metals in Solids by ICP-AES			
		Arsenic	mg/kg	21.4	5.50
		Zinc	mg/kg	1690	5.50
		Cadmium	mg/kg	8.16	1.10
		Lead	mg/kg	1360	5.50
72-__	1	Percent Solid			
		Solids, percent	%	88.3	
73-__	1	Metals in Solids by ICP-AES			
		Barium	mg/kg	157	2.46
		Arsenic	mg/kg	7.52	6.14
		Zinc	mg/kg	1270	6.14
		Cadmium	mg/kg	6.52	1.23
		Lead	mg/kg	585	6.14
73-__	1	Percent Solid			
		Solids, percent	%	78.2	
74-__	1	Metals in Solids by ICP-AES			
		Barium	mg/kg	158	2.50
		Arsenic	mg/kg	16.8	6.24
		Zinc	mg/kg	1530	6.24
		Cadmium	mg/kg	8.80	1.25
		Lead	mg/kg	844	6.24
74-__	1	Percent Solid			
		Solids, percent	%	77.1	
75-__	1	Metals in Solids by ICP-AES			
		Arsenic	mg/kg	16.6	5.76
		Barium	mg/kg	137	2.31
		Zinc	mg/kg	1200	5.76
		Cadmium	mg/kg	6.79	1.15
		Lead	mg/kg	464	5.76
75-__	1	Percent Solid			
		Solids, percent	%	80.3	

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AA

Memo From: Barry Evans, EPA Lab
Telephone: (913) 551-5144

HRS Analysis Results Supplement

07/30/2012

ASR Number: 3159

This report supplements the information contained in the Transmittal of Sample Analysis Results for ASR 3159 sent to Eddie McGlasson on 01/04/2007 for: EMA78Q00 - United Zinc No. 1 site sampling. The transmittal contains the explanation of codes, units, and qualifiers; sample information; analysis information and comments; and the analytical results. The RL in this supplement is the laboratory's reporting limit for that analyte with any dilution factor, volume adjustment, or percent solids for that sample analysis taken into account and is sometimes called the sample quantitation limit, SQL.

Sample	Analysis / Analyte		Units	Result	RL
1-__	1	Metals in Solids by ICP-AES			
		Arsenic	mg/kg	14.0	7.12
		Barium	mg/kg	178	2.85
		Zinc	mg/kg	1930	7.12
		Lead	mg/kg	692	7.12
		Cadmium	mg/kg	12.8	1.42
1-__	1	Percent Solid			
		Solids, percent	%	68.5	
2-__	1	Metals in Solids by ICP-AES			
		Barium	mg/kg	213	2.40
		Arsenic	mg/kg	8.12	5.99
		Zinc	mg/kg	767	5.99
		Cadmium	mg/kg	6.32	1.20
		Lead	mg/kg	360	5.99
2-__	1	Percent Solid			
		Solids, percent	%	79.4	
3-__	1	Metals in Solids by ICP-AES			
		Barium	mg/kg	134	2.87
		Arsenic	mg/kg	12.7	7.17
		Zinc	mg/kg	1990	7.17
		Cadmium	mg/kg	10.6	1.43
		Lead	mg/kg	851	7.17
3-__	1	Percent Solid			
		Solids, percent	%	65.7	
4-__	1	Metals in Solids by ICP-AES			
		Barium	mg/kg	159	2.60
		Arsenic	mg/kg	19.2	6.50
		Zinc	mg/kg	2220	6.50
		Cadmium	mg/kg	10.2	1.30
		Lead	mg/kg	1290	6.50
4-__	1	Percent Solid			
		Solids, percent	%	73.4	

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ASR Number: 3159 **HRS Analysis Results Supplement** 07/30/2012

Sample	Analysis / Analyte		Units	Result	RL
5-__	1	Metals in Solids by ICP-AES			
		Barium	mg/kg	196	2.60
		Arsenic	mg/kg	8.33	6.49
		Zinc	mg/kg	2090	6.49
		Cadmium	mg/kg	12.6	1.30
		Lead	mg/kg	983	6.49
5-__	1	Percent Solid			
		Solids, percent	%	73.4	
6-__	1	Metals in Solids by ICP-AES			
		Barium	mg/kg	178	2.51
		Arsenic	mg/kg	12.9	6.28
		Zinc	mg/kg	1170	6.28
		Cadmium	mg/kg	7.24	1.26
		Lead	mg/kg	443	6.28
6-__	1	Percent Solid			
		Solids, percent	%	76.5	
7-__	1	Metals in Solids by ICP-AES			
		Barium	mg/kg	261	2.50
		Arsenic	mg/kg	11.8	6.25
		Zinc	mg/kg	1800	6.25
		Cadmium	mg/kg	8.92	1.25
		Lead	mg/kg	978	6.25
7-__	1	Percent Solid			
		Solids, percent	%	75.8	
8-__	1	Metals in Solids by ICP-AES			
		Barium	mg/kg	177	2.54
		Arsenic	mg/kg	13.2	6.34
		Zinc	mg/kg	1860	6.34
		Cadmium	mg/kg	10.5	1.27
		Lead	mg/kg	893	6.34
8-__	1	Percent Solid			
		Solids, percent	%	75.1	
9-__	1	Metals in Solids by ICP-AES			
		Barium	mg/kg	201	2.45
		Arsenic	mg/kg	14.5	6.13
		Zinc	mg/kg	1400	6.13
		Cadmium	mg/kg	9.25	1.23
		Lead	mg/kg	606	6.13
9-__	1	Percent Solid			
		Solids, percent	%	78.0	
10-__	1	Metals in Solids by ICP-AES			
		Barium	mg/kg	150	2.53

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ASR Number: 3159 **HRS Analysis Results Supplement** 07/30/2012

Sample	Analysis / Analyte		Units	Result	RL
10-__	1	Metals in Solids by ICP-AES			
		Arsenic	mg/kg	12.4	6.32
		Zinc	mg/kg	1740	6.32
		Cadmium	mg/kg	13.4	1.26
		Lead	mg/kg	1020	6.32
10-__	1	Percent Solid			
		Solids, percent	%	75.8	
11-__	1	Metals in Solids by ICP-AES			
		Barium	mg/kg	120	2.56
		Arsenic	mg/kg	9.91	6.41
		Zinc	mg/kg	649	6.41
		Cadmium	mg/kg	6.71	1.28
		Lead	mg/kg	251	6.41
11-__	1	Percent Solid			
		Solids, percent	%	73.9	
12-__	1	Metals in Solids by ICP-AES			
		Barium	mg/kg	217	2.31
		Arsenic	mg/kg	16.4	5.77
		Zinc	mg/kg	1220	5.77
		Cadmium	mg/kg	7.97	1.15
		Lead	mg/kg	519	5.77
12-__	1	Percent Solid			
		Solids, percent	%	81.5	
13-__	1	Metals in Solids by ICP-AES			
		Barium	mg/kg	196	2.61
		Arsenic	mg/kg	9.07	6.52
		Zinc	mg/kg	1390	6.52
		Cadmium	mg/kg	9.24	1.30
		Lead	mg/kg	678	6.52
13-__	1	Percent Solid			
		Solids, percent	%	73.9	
14-__	1	Metals in Solids by ICP-AES			
		Barium	mg/kg	171	2.55
		Arsenic	mg/kg	13.9	6.37
		Zinc	mg/kg	1150	6.37
		Cadmium	mg/kg	7.63	1.27
		Lead	mg/kg	904	6.37
14-__	1	Percent Solid			
		Solids, percent	%	75.6	
15-__	1	Metals in Solids by ICP-AES			
		Barium	mg/kg	182	2.56
		Arsenic	mg/kg	12.1	6.41

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Memo From: Barry Evans, EPA Lab
Telephone: (913) 551-5144

Reference 44

Sample	Analysis / Analyte		Units	Result	RL
15-__	1	Metals in Solids by ICP-AES			
		Zinc	mg/kg	2160	6.41
		Cadmium	mg/kg	10.6	1.28
		Lead	mg/kg	883	6.41
15-__	1	Percent Solid			
		Solids, percent	%	74.8	

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Memo From: Barry Evans, EPA Lab
Telephone: (913) 551-5144 Reference 45

HRS Analysis Results Supplement

07/30/2012

ASR Number: 3161

This report supplements the information contained in the Transmittal of Sample Analysis Results for ASR 3161 sent to Eddie McGlasson on 08/11/2006 for: EMA78Q00 - United Zinc No. 1 site sampling. The transmittal contains the explanation of codes, units, and qualifiers; sample information; analysis information and comments; and the analytical results. The RL in this supplement is the laboratory's reporting limit for that analyte with any dilution factor, volume adjustment, or percent solids for that sample analysis taken into account and is sometimes called the sample quantitation limit, SQL.

Sample	Analysis / Analyte		Units	Result	RL
1-__	1	Metals in Solids by ICP-AES			
		Lead	mg/kg	3300	4.54
1-__	1	Percent Solid			
		Solids, percent	%	98.5	
1-__	1	TCLP Metals in Soil			
		Lead	mg/L	1.88	
2-__	1	Metals in Solids by ICP-AES			
		Lead	mg/kg	1100 J	4.84
2-__	1	Percent Solid			
		Solids, percent	%	95.4	
2-__	1	TCLP Metals in Soil			
		Lead	mg/L	0.125	
3-__	1	Metals in Solids by ICP-AES			
		Lead	mg/kg	200	4.96
3-__	1	Percent Solid			
		Solids, percent	%	93.7	
3-__	1	TCLP Metals in Soil			
		Lead	mg/L	0.05 U	
4-__	1	Metals in Solids by ICP-AES			
		Lead	mg/kg	2360	5.43
4-__	1	Percent Solid			
		Solids, percent	%	91.7	
4-__	1	TCLP Metals in Soil			
		Lead	mg/L	0.426	
5-__	1	Metals in Solids by ICP-AES			
		Lead	mg/kg	563	5.09
5-__	1	Percent Solid			
		Solids, percent	%	94.0	
5-__	1	TCLP Metals in Soil			

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Memo From: Barry Evans, EPA Lab
Telephone: (913) 551-5144

ASR Number: 3161 **HRS Analysis Results Supplement** 07/30/2012

Sample	Analysis / Analyte	Units	Result	RL
5-__	1 TCLP Metals in Soil			
	Lead	mg/L	0.066	

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Memo From: Barry Evans, EPA Lab
Telephone: (913) 551-5144

HRS Analysis Results Supplement

07/30/2012

ASR Number: 3279

This report supplements the information contained in the Transmittal of Sample Analysis Results for ASR 3279 sent to Eddie McGlasson on 02/15/2007 for: EMA78Q00 - United Zinc No. 1 site sampling. The transmittal contains the explanation of codes, units, and qualifiers; sample information; analysis information and comments; and the analytical results. The RL in this supplement is the laboratory's reporting limit for that analyte with any dilution factor, volume adjustment, or percent solids for that sample analysis taken into account and is sometimes called the sample quantitation limit, SQL.

Sample	Analysis / Analyte		Units	Result	RL
1-__	1	Metals in Solids by ICP-AES			
		Arsenic	mg/kg	16.8	6.3
		Barium	mg/kg	239	2.5
		Zinc	mg/kg	1660	6.3
		Lead	mg/kg	935	6.3
		Cadmium	mg/kg	10.4	1.3
1-__	1	Percent Solid			
		Solids, percent	%	77.2	
2-__	1	Metals in Solids by ICP-AES			
		Barium	mg/kg	150	2.8
		Arsenic	mg/kg	11.6	7.1
		Zinc	mg/kg	2020	7.1
		Cadmium	mg/kg	12.5	1.4
		Lead	mg/kg	1080	7.1
2-__	1	Percent Solid			
		Solids, percent	%	70.6	
3-__	1	Metals in Solids by ICP-AES			
		Barium	mg/kg	171	2.4
		Arsenic	mg/kg	23.8	6.1
		Zinc	mg/kg	1780	6.1
		Cadmium	mg/kg	11.7	1.2
		Lead	mg/kg	3300	6.1
3-__	1	Percent Solid			
		Solids, percent	%	74.8	
4-__	1	Metals in Solids by ICP-AES			
		Barium	mg/kg	419	2.5
		Arsenic	mg/kg	6.2	6.2
		Zinc	mg/kg	1280	6.2
		Cadmium	mg/kg	7.6	1.2
		Lead	mg/kg	777	6.2
4-__	1	Percent Solid			
		Solids, percent	%	73.7	

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ASR Number: 3279 **HRS Analysis Results Supplement** 07/30/2012

Sample	Analysis / Analyte		Units	Result	RL
5-__	1	Metals in Solids by ICP-AES			
		Barium	mg/kg	145	2.4
		Arsenic	mg/kg	6.5	6.0
		Zinc	mg/kg	1710	6.0
		Cadmium	mg/kg	11.0	1.2
		Lead	mg/kg	744	6.0
5-__	1	Percent Solid			
		Solids, percent	%	80.9	
6-__	1	Metals in Solids by ICP-AES			
		Barium	mg/kg	213	2.6
		Arsenic	mg/kg	36.4	6.5
		Zinc	mg/kg	2350	6.5
		Cadmium	mg/kg	57.7	1.3
		Lead	mg/kg	1600	6.5
6-__	1	Percent Solid			
		Solids, percent	%	74.4	
7-__	1	Metals in Solids by ICP-AES			
		Barium	mg/kg	193	2.5
		Arsenic	mg/kg	15.8	6.2
		Zinc	mg/kg	2190	6.2
		Cadmium	mg/kg	12.5	1.2
		Lead	mg/kg	1090	6.2
7-__	1	Percent Solid			
		Solids, percent	%	73.0	
8-__	1	Metals in Solids by ICP-AES			
		Barium	mg/kg	195	2.6
		Arsenic	mg/kg	8.0	6.6
		Zinc	mg/kg	761	6.6
		Cadmium	mg/kg	7.5	1.3
		Lead	mg/kg	380	6.6
8-__	1	Percent Solid			
		Solids, percent	%	75.0	
9-__	1	Metals in Solids by ICP-AES			
		Barium	mg/kg	208	2.6
		Arsenic	mg/kg	6.5 U	6.5
		Zinc	mg/kg	940	6.5
		Cadmium	mg/kg	7.5	1.3
		Lead	mg/kg	806	6.5
9-__	1	Percent Solid			
		Solids, percent	%	75.5	
10-__	1	Metals in Solids by ICP-AES			
		Barium	mg/kg	260	2.4

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ASR Number: 3279 **HRS Analysis Results Supplement** 07/30/2012

Sample	Analysis / Analyte	Units	Result	RL
10-__	1 Metals in Solids by ICP-AES			
	Arsenic	mg/kg	7.3	5.9
	Zinc	mg/kg	1480	5.9
	Cadmium	mg/kg	9.7	1.2
	Lead	mg/kg	775	5.9
10-__	1 Percent Solid			
	Solids, percent	%	77.1	
11-__	1 Metals in Solids by ICP-AES			
	Barium	mg/kg	247	2.6
	Arsenic	mg/kg	18.3	6.4
	Zinc	mg/kg	2480	6.4
	Cadmium	mg/kg	12.3	1.3
	Lead	mg/kg	1960	6.4
11-__	1 Percent Solid			
	Solids, percent	%	72.6	
12-__	1 Metals in Solids by ICP-AES			
	Barium	mg/kg	128	2.6
	Arsenic	mg/kg	6.6 U	6.6
	Zinc	mg/kg	1270	6.6
	Cadmium	mg/kg	12.1	1.3
	Lead	mg/kg	451	6.6
12-__	1 Percent Solid			
	Solids, percent	%	73.5	
13-__	1 Metals in Solids by ICP-AES			
	Barium	mg/kg	236	2.6
	Arsenic	mg/kg	15.4	6.4
	Zinc	mg/kg	931	6.4
	Cadmium	mg/kg	8.9	1.3
	Lead	mg/kg	378	6.4
13-__	1 Percent Solid			
	Solids, percent	%	77.4	
14-__	1 Metals in Solids by ICP-AES			
	Barium	mg/kg	157	2.3
	Arsenic	mg/kg	7.9	5.6
	Zinc	mg/kg	766	5.6
	Cadmium	mg/kg	7.7	1.1
	Lead	mg/kg	396	5.6
14-__	1 Percent Solid			
	Solids, percent	%	78.1	
15-__	1 Metals in Solids by ICP-AES			
	Barium	mg/kg	277	2.5
	Arsenic	mg/kg	16.6	6.2

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ASR Number: 3279 **HRS Analysis Results Supplement** 07/30/2012

Sample	Analysis / Analyte		Units	Result	RL
15-__	1	Metals in Solids by ICP-AES			
		Zinc	mg/kg	442	6.2
		Cadmium	mg/kg	6.7	1.2
		Lead	mg/kg	212	6.2
15-__	1	Percent Solid			
		Solids, percent	%	79.4	
16-__	1	Metals in Solids by ICP-AES			
		Barium	mg/kg	131	2.6
		Arsenic	mg/kg	6.5 U	6.5
		Zinc	mg/kg	1160	6.5
		Cadmium	mg/kg	8.1	1.3
		Lead	mg/kg	496	6.5
16-__	1	Percent Solid			
		Solids, percent	%	74.9	
17-__	1	Metals in Solids by ICP-AES			
		Barium	mg/kg	219	2.8
		Arsenic	mg/kg	7.0 U	7.0
		Zinc	mg/kg	1110	7.0
		Cadmium	mg/kg	6.9	1.4
		Lead	mg/kg	602	7.0
17-__	1	Percent Solid			
		Solids, percent	%	68.4	
18-__	1	Metals in Solids by ICP-AES			
		Barium	mg/kg	144	2.7
		Arsenic	mg/kg	6.6 U	6.6
		Zinc	mg/kg	1050	6.6
		Cadmium	mg/kg	7.3	1.3
		Lead	mg/kg	314	6.6
18-__	1	Percent Solid			
		Solids, percent	%	72.4	

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Memo From: Barry Evans, EPA Lab
Telephone: (913) 551-5144

Reference 47

HRS Analysis Results Supplement

07/30/2012

ASR Number: 3280

This report supplements the information contained in the Transmittal of Sample Analysis Results for ASR 3280 sent to Eddie McGlasson on 03/12/2007 for: EMA78Q00 - United Zinc No. 1 site sampling. The transmittal contains the explanation of codes, units, and qualifiers; sample information; analysis information and comments; and the analytical results. The RL in this supplement is the laboratory's reporting limit for that analyte with any dilution factor, volume adjustment, or percent solids for that sample analysis taken into account and is sometimes called the sample quantitation limit, SQL.

Sample	Analysis / Analyte		Units	Result	RL
1-__	1	Metals in Solids by ICP-AES			
		Barium	mg/kg	159	2.3
		Arsenic	mg/kg	5.7 U	5.7
		Zinc	mg/kg	693	5.7
		Cadmium	mg/kg	6.7	1.1
		Lead	mg/kg	221	5.7
1-__	1	Percent Solid			
		Solids, percent	%	86.5	
2-__	1	Metals in Solids by ICP-AES			
		Barium	mg/kg	147	2.4
		Arsenic	mg/kg	6.0 U	6.0
		Zinc	mg/kg	1130	6.0
		Cadmium	mg/kg	9.5	1.2
		Lead	mg/kg	377	6.0
2-__	1	Percent Solid			
		Solids, percent	%	82.0	
3-__	1	Metals in Solids by ICP-AES			
		Barium	mg/kg	151	2.3
		Arsenic	mg/kg	12.1	5.7
		Zinc	mg/kg	1980	5.7
		Cadmium	mg/kg	20.7	1.1
		Lead	mg/kg	774	5.7
3-__	1	Percent Solid			
		Solids, percent	%	84.7	
4-__	1	Metals in Solids by ICP-AES			
		Barium	mg/kg	161	2.3
		Arsenic	mg/kg	61.2	5.6
		Zinc	mg/kg	878	5.6
		Cadmium	mg/kg	8.6	1.1
		Lead	mg/kg	524	5.6
4-__	1	Percent Solid			
		Solids, percent	%	87.6	

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Sample	Analysis / Analyte	Units	Result	RL
5-__	1 Metals in Solids by ICP-AES			
	Lead	mg/kg	1120	5.7
	Cadmium	mg/kg	8.7	1.1
	Barium	mg/kg	249	2.3
	Zinc	mg/kg	1160	5.7
	Arsenic	mg/kg	8.0	5.7
5-__	1 Percent Solid			
	Solids, percent	%	84.9	
6-__	1 Metals in Solids by ICP-AES			
	Barium	mg/kg	181	2.2
	Arsenic	mg/kg	8.0	5.6
	Zinc	mg/kg	1110	5.6
	Cadmium	mg/kg	7.9	1.1
	Lead	mg/kg	1610	5.6
6-__	1 Percent Solid			
	Solids, percent	%	86.7	
7-__	1 Metals in Solids by ICP-AES			
	Barium	mg/kg	455	2.1
	Arsenic	mg/kg	12.3	5.3
	Zinc	mg/kg	1930	5.3
	Cadmium	mg/kg	13.4	1.1
	Lead	mg/kg	2510	5.3
7-__	1 Percent Solid			
	Solids, percent	%	94.0	
8-__	1 Metals in Solids by ICP-AES			
	Barium	mg/kg	340	2.1
	Arsenic	mg/kg	21.7	5.3
	Zinc	mg/kg	1340	5.3
	Cadmium	mg/kg	9.3	1.1
	Lead	mg/kg	1480	5.3
8-__	1 Percent Solid			
	Solids, percent	%	94.0	
9-__	1 Metals in Solids by ICP-AES			
	Barium	mg/kg	159	2.1
	Arsenic	mg/kg	14.0	5.3
	Zinc	mg/kg	1550	5.3
	Cadmium	mg/kg	12.2	1.1
	Lead	mg/kg	1180	5.3
9-__	1 Percent Solid			
	Solids, percent	%	93.0	
10-__	1 Metals in Solids by ICP-AES			
	Barium	mg/kg	252	2.1

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Sample	Analysis / Analyte		Units	Result	RL
10-__	1	Metals in Solids by ICP-AES			
		Arsenic	mg/kg	5.2 U	5.2
		Zinc	mg/kg	898	5.2
		Cadmium	mg/kg	7.4	1.0
		Lead	mg/kg	482	5.2
10-__	1	Percent Solid			
		Solids, percent	%	95.2	
11-__	1	Metals in Solids by ICP-AES			
		Barium	mg/kg	161	2.1
		Arsenic	mg/kg	15.4	5.4
		Zinc	mg/kg	1240	5.4
		Cadmium	mg/kg	10.5	1.1
		Lead	mg/kg	837	5.4
11-__	1	Percent Solid			
		Solids, percent	%	92.6	
12-__	1	Metals in Solids by ICP-AES			
		Barium	mg/kg	211	2.2
		Arsenic	mg/kg	11.1	5.4
		Zinc	mg/kg	1560	5.4
		Cadmium	mg/kg	11.2	1.1
		Lead	mg/kg	880	5.4
12-__	1	Percent Solid			
		Solids, percent	%	90.3	
13-__	1	Metals in Solids by ICP-AES			
		Barium	mg/kg	186	2.1
		Arsenic	mg/kg	20.0	5.3
		Zinc	mg/kg	2390	5.3
		Cadmium	mg/kg	13.4	1.1
		Lead	mg/kg	1150	5.3
13-__	1	Percent Solid			
		Solids, percent	%	93.2	
14-__	1	Metals in Solids by ICP-AES			
		Barium	mg/kg	188	2.1
		Arsenic	mg/kg	5.2 U	5.2
		Zinc	mg/kg	981	5.2
		Cadmium	mg/kg	8.5	1.0
		Lead	mg/kg	685	5.2
14-__	1	Percent Solid			
		Solids, percent	%	94.1	
15-__	1	Metals in Solids by ICP-AES			
		Barium	mg/kg	150	2.4
		Arsenic	mg/kg	8.9	5.9

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Sample	Analysis / Analyte		Units	Result	RL
15-__	1	Metals in Solids by ICP-AES			
		Zinc	mg/kg	1330	5.9
		Cadmium	mg/kg	9.2	1.2
		Lead	mg/kg	1070	5.9
15-__	1	Percent Solid			
		Solids, percent	%	83.3	
16-__	1	Metals in Solids by ICP-AES			
		Barium	mg/kg	148	2.3
		Arsenic	mg/kg	8.8	5.7
		Zinc	mg/kg	1840	5.7
		Cadmium	mg/kg	9.9	1.1
		Lead	mg/kg	806	5.7
16-__	1	Percent Solid			
		Solids, percent	%	79.2	
17-__	1	Metals in Solids by ICP-AES			
		Barium	mg/kg	159	2.1
		Arsenic	mg/kg	5.5	5.3
		Zinc	mg/kg	864	5.3
		Cadmium	mg/kg	7.4	1.1
		Lead	mg/kg	396	5.3
17-__	1	Percent Solid			
		Solids, percent	%	91.7	
18-__	1	Metals in Solids by ICP-AES			
		Barium	mg/kg	139	2.1
		Arsenic	mg/kg	5.4 U	5.4
		Zinc	mg/kg	646	5.4
		Cadmium	mg/kg	6.7	1.1
		Lead	mg/kg	281	5.4
18-__	1	Percent Solid			
		Solids, percent	%	91.2	
19-__	1	Metals in Solids by ICP-AES			
		Arsenic	mg/kg	12.2	5.3
		Barium	mg/kg	240	2.1
		Cadmium	mg/kg	9.7	1.1
		Lead	mg/kg	805	5.3
		Zinc	mg/kg	1240	5.3
19-__	1	Percent Solid			
		Solids, percent	%	92.2	
20-__	1	Metals in Solids by ICP-AES			
		Barium	mg/kg	655	2.6
		Arsenic	mg/kg	20.0	6.5
		Zinc	mg/kg	2190	6.5

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Sample	Analysis / Analyte		Units	Result	RL
20-__	1	Metals in Solids by ICP-AES			
		Cadmium	mg/kg	14.4	1.3
		Lead	mg/kg	1770	6.5
20-__	1	Percent Solid			
		Solids, percent	%	75.1	
21-__	1	Metals in Solids by ICP-AES			
		Barium	mg/kg	260	2.1
		Arsenic	mg/kg	31.3	5.2
		Zinc	mg/kg	944	5.2
		Cadmium	mg/kg	9.1	1.0
		Lead	mg/kg	605	5.2
21-__	1	Percent Solid			
		Solids, percent	%	94.8	
22-__	1	Metals in Solids by ICP-AES			
		Barium	mg/kg	181	2.1
		Arsenic	mg/kg	5.1 U	5.1
		Zinc	mg/kg	753	5.1
		Cadmium	mg/kg	8.0	1.0
		Lead	mg/kg	341	5.1
22-__	1	Percent Solid			
		Solids, percent	%	92.5	
23-__	1	Metals in Solids by ICP-AES			
		Cadmium	mg/kg	7.3	1.0
		Barium	mg/kg	204	2.1
		Arsenic	mg/kg	5.2 U	5.2
		Lead	mg/kg	445	5.2
		Zinc	mg/kg	844	5.2
23-__	1	Percent Solid			
		Solids, percent	%	94.4	
24-__	1	Metals in Solids by ICP-AES			
		Barium	mg/kg	196	2.1
		Arsenic	mg/kg	11.3	5.4
		Zinc	mg/kg	1950	5.4
		Cadmium	mg/kg	14.3	1.1
		Lead	mg/kg	838	5.4
24-__	1	Percent Solid			
		Solids, percent	%	92.9	
25-__	1	Metals in Solids by ICP-AES			
		Barium	mg/kg	244	2.1
		Arsenic	mg/kg	7.2	5.2
		Zinc	mg/kg	1740	5.2
		Cadmium	mg/kg	11.2	1.0

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Sample	Analysis / Analyte	Units	Result	RL
25-__	1 Metals in Solids by ICP-AES			
	Lead	mg/kg	998	5.2
25-__	1 Percent Solid			
	Solids, percent	%	94.2	
26-__	1 Metals in Solids by ICP-AES			
	Barium	mg/kg	170	2.2
	Arsenic	mg/kg	6.5	5.5
	Zinc	mg/kg	560	5.5
	Cadmium	mg/kg	7.1	1.1
	Lead	mg/kg	186	5.5
26-__	1 Percent Solid			
	Solids, percent	%	86.4	
27-__	1 Metals in Solids by ICP-AES			
	Barium	mg/kg	192	2.1
	Arsenic	mg/kg	5.3 U	5.3
	Cadmium	mg/kg	10.3	1.1
	Lead	mg/kg	702	5.3
	Zinc	mg/kg	1560	5.3
27-__	1 Percent Solid			
	Solids, percent	%	93.4	
28-__	1 Metals in Solids by ICP-AES			
	Barium	mg/kg	220	2.1
	Arsenic	mg/kg	12.9	5.3
	Zinc	mg/kg	1610	5.3
	Cadmium	mg/kg	12.5	1.1
	Lead	mg/kg	755	5.3
28-__	1 Percent Solid			
	Solids, percent	%	92.8	
29-__	1 Metals in Solids by ICP-AES			
	Barium	mg/kg	121	2.4
	Arsenic	mg/kg	6.0 U	6.0
	Zinc	mg/kg	1190	6.0
	Cadmium	mg/kg	8.2	1.2
	Lead	mg/kg	528	6.0
29-__	1 Percent Solid			
	Solids, percent	%	81.2	
30-__	1 Metals in Solids by ICP-AES			
	Arsenic	mg/kg	5.3 U	5.3
	Barium	mg/kg	157	2.1
	Zinc	mg/kg	1030	5.3
	Lead	mg/kg	576	5.3
	Cadmium	mg/kg	9.2	1.1

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Sample	Analysis / Analyte		Units	Result	RL
30-__	1	Percent Solid			
		Solids, percent	%	92.7	
31-__	1	Metals in Solids by ICP-AES			
		Barium	mg/kg	324	2.2
		Arsenic	mg/kg	12.9	5.4
		Zinc	mg/kg	1560	5.4
		Cadmium	mg/kg	9.4	1.1
		Lead	mg/kg	1260	5.4
31-__	1	Percent Solid			
		Solids, percent	%	92.0	

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Memo From: Barry Evans, EPA Lab
Telephone: (913) 551-5144 Reference 48

HRS Analysis Results Supplement

07/30/2012

ASR Number: 3281

This report supplements the information contained in the Transmittal of Sample Analysis Results for ASR 3281 sent to Eddie McGlasson on 04/06/2007 for: EMA78Q00 - United Zinc No. 1 site sampling. The transmittal contains the explanation of codes, units, and qualifiers; sample information; analysis information and comments; and the analytical results. The RL in this supplement is the laboratory's reporting limit for that analyte with any dilution factor, volume adjustment, or percent solids for that sample analysis taken into account and is sometimes called the sample quantitation limit, SQL.

Sample	Analysis / Analyte		Units	Result	RL
1-__	1	Metals in Solids by ICP-AES			
		Lead	mg/kg	459	1.07
		Zinc	mg/kg	1080	6.44
		Cadmium	mg/kg	3.30	0.536
		Barium	mg/kg	168	21.5
		Arsenic	mg/kg	9.83	1.07
2-__	1	Metals in Solids by ICP-AES			
		Arsenic	mg/kg	9.53	1.08
		Lead	mg/kg	592	1.08
		Cadmium	mg/kg	5.83	0.539
		Zinc	mg/kg	1290	6.47
		Barium	mg/kg	204	21.6
3-__	1	Metals in Solids by ICP-AES			
		Lead	mg/kg	592	1.04
		Arsenic	mg/kg	15.3	1.04
		Barium	mg/kg	288	20.8
		Cadmium	mg/kg	5.61	0.520
		Zinc	mg/kg	1530	6.24
4-__	1	Metals in Solids by ICP-AES			
		Cadmium	mg/kg	8.64	0.523
		Barium	mg/kg	143	20.9
		Zinc	mg/kg	2130	6.28
		Arsenic	mg/kg	13.6	1.05
		Lead	mg/kg	761	1.05
5-__	1	Metals in Solids by ICP-AES			
		Barium	mg/kg	178	21.2
		Arsenic	mg/kg	8.91	1.06
		Cadmium	mg/kg	10.1	0.531
		Zinc	mg/kg	1510	6.37
		Lead	mg/kg	450	1.06
6-__	1	Metals in Solids by ICP-AES			
		Zinc	mg/kg	796	6.21
		Arsenic	mg/kg	8.14 J	1.04
		Barium	mg/kg	161	20.7

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Sample	Analysis / Analyte	Units	Result	RL
6-__	1 Metals in Solids by ICP-AES			
	Cadmium	mg/kg	2.95	0.518
	Lead	mg/kg	430	1.04
7-__	1 Metals in Solids by ICP-AES			
	Barium	mg/kg	138	21.1
	Zinc	mg/kg	1590	6.32
	Cadmium	mg/kg	5.48	0.526
	Lead	mg/kg	953	1.05
	Arsenic	mg/kg	16.1	1.05
8-__	1 Metals in Solids by ICP-AES			
	Zinc	mg/kg	1030	6.22
	Barium	mg/kg	217	20.7
	Cadmium	mg/kg	4.41	0.519
	Lead	mg/kg	489	1.04
	Arsenic	mg/kg	10.7	1.04
9-__	1 Metals in Solids by ICP-AES			
	Arsenic	mg/kg	7.98 J	1.10
	Barium	mg/kg	255	22.0
	Zinc	mg/kg	904	6.59
	Cadmium	mg/kg	2.78	0.549
	Lead	mg/kg	481	1.10
10-__	1 Metals in Solids by ICP-AES			
	Cadmium	mg/kg	7.42	0.529
	Lead	mg/kg	1270	1.06
	Zinc	mg/kg	2610	6.34
	Arsenic	mg/kg	18.7	1.06
	Barium	mg/kg	179	21.1
11-__	1 Metals in Solids by ICP-AES			
	Arsenic	mg/kg	9.07	1.09
	Barium	mg/kg	152	21.9
	Cadmium	mg/kg	5.00	0.547
	Lead	mg/kg	450	1.09
	Zinc	mg/kg	999	6.56
12-__	1 Metals in Solids by ICP-AES			
	Barium	mg/kg	157	20.7
	Cadmium	mg/kg	3.06	0.518
	Lead	mg/kg	334	1.04
	Zinc	mg/kg	673	6.21
	Arsenic	mg/kg	8.69	1.04
13-__	1 Metals in Solids by ICP-AES			
	Arsenic	mg/kg	24.5	1.08
	Barium	mg/kg	150	21.5
	Zinc	mg/kg	2100	6.46

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Sample	Analysis / Analyte		Units	Result	RL
13-__	1	Metals in Solids by ICP-AES			
		Lead	mg/kg	3210	2.15
		Cadmium	mg/kg	6.05	0.538
14-__	1	Metals in Solids by ICP-AES			
		Zinc	mg/kg	1810	6.23
		Cadmium	mg/kg	7.10	0.519
		Arsenic	mg/kg	10.6	1.04
		Lead	mg/kg	895	1.04
		Barium	mg/kg	174	20.8
15-__	1	Metals in Solids by ICP-AES			
		Lead	mg/kg	391	1.04
		Zinc	mg/kg	1470	6.21
		Barium	mg/kg	140	20.7
		Arsenic	mg/kg	6.54 J	1.04
		Cadmium	mg/kg	9.10	0.518
16-__	1	Metals in Solids by ICP-AES			
		Barium	mg/kg	153	21.0
		Arsenic	mg/kg	3.11 UJ	1.05
		Cadmium	mg/kg	0.786	0.526
		Lead	mg/kg	187	1.05
		Zinc	mg/kg	67.4	6.31
17-__	1	Metals in Solids by ICP-AES			
		Arsenic	mg/kg	9.76	1.15
		Cadmium	mg/kg	5.44	0.575
		Barium	mg/kg	227	23.0
		Lead	mg/kg	528	1.15
		Zinc	mg/kg	1570	6.90
18-__	1	Metals in Solids by ICP-AES			
		Lead	mg/kg	182	1.21
		Barium	mg/kg	219	24.2
		Zinc	mg/kg	539	7.25
		Cadmium	mg/kg	3.09	0.604
		Arsenic	mg/kg	6.07 J	1.21
19-__	1	Metals in Solids by ICP-AES			
		Arsenic	mg/kg	14.9	1.31
		Zinc	mg/kg	1810	7.84
		Lead	mg/kg	553	1.31
		Barium	mg/kg	156	26.1
		Cadmium	mg/kg	5.05	0.654
20-__	1	Metals in Solids by ICP-AES			
		Arsenic	mg/kg	6.34 J	1.24
		Lead	mg/kg	315	1.24
		Barium	mg/kg	175	24.8

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ASR Number: 3281 **HRS Analysis Results Supplement** 07/30/2012

Sample	Analysis / Analyte	Units	Result	RL
20-__	1 Metals in Solids by ICP-AES			
	Zinc	mg/kg	657	7.45
	Cadmium	mg/kg	2.85	0.621

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HRS Analysis Results Supplement

07/30/2012

ASR Number: 3282

This report supplements the information contained in the Transmittal of Sample Analysis Results for ASR 3282 sent to Eddie McGlasson on 05/07/2007 for: EMA78Q00 - United Zinc No. 1 site sampling. The transmittal contains the explanation of codes, units, and qualifiers; sample information; analysis information and comments; and the analytical results. The RL in this supplement is the laboratory's reporting limit for that analyte with any dilution factor, volume adjustment, or percent solids for that sample analysis taken into account and is sometimes called the sample quantitation limit, SQL.

Sample	Analysis / Analyte		Units	Result	RL
1-__	1	Metals in Solids by ICP-AES			
		Barium	mg/kg	274	2.2
		Lead	mg/kg	216	5.5
		Zinc	mg/kg	393	5.5
		Cadmium	mg/kg	7.2	1.1
		Arsenic	mg/kg	9.5	5.5
1-__	1	Percent Solid			
		Solids, percent	%	88.8	
2-__	1	Metals in Solids by ICP-AES			
		Barium	mg/kg	223	2.1
		Lead	mg/kg	233	5.2
		Arsenic	mg/kg	6.0	5.2
		Zinc	mg/kg	913	5.2
		Cadmium	mg/kg	11.3	1.0
2-__	1	Percent Solid			
		Solids, percent	%	93.1	
3-__	1	Metals in Solids by ICP-AES			
		Zinc	mg/kg	1200	5.2
		Cadmium	mg/kg	10.2	1.0
		Barium	mg/kg	212	2.1
		Arsenic	mg/kg	9.2	5.2
		Lead	mg/kg	523	5.2
3-__	1	Percent Solid			
		Solids, percent	%	93.7	
4-__	1	Metals in Solids by ICP-AES			
		Barium	mg/kg	200	2.7
		Arsenic	mg/kg	14.1	6.7
		Zinc	mg/kg	1720	6.7
		Lead	mg/kg	931	6.7
		Cadmium	mg/kg	10.1	1.3
4-__	1	Percent Solid			
		Solids, percent	%	73.4	

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Memo From: Barry Evans, EPA Lab
Telephone: (913) 551-5144 Reference 49

ASR Number: 3282 **HRS Analysis Results Supplement** 07/30/2012

Sample	Analysis / Analyte		Units	Result	RL
5-__	1	Metals in Solids by ICP-AES			
		Lead	mg/kg	339	5.9
		Zinc	mg/kg	1010	5.9
		Cadmium	mg/kg	8.4	1.2
		Arsenic	mg/kg	11.1	5.9
		Barium	mg/kg	146	2.4
5-__	1	Percent Solid			
		Solids, percent	%	84.0	
6-__	1	Metals in Solids by ICP-AES			
		Lead	mg/kg	261	5.5
		Cadmium	mg/kg	7.6	1.1
		Barium	mg/kg	157	2.2
		Arsenic	mg/kg	7.7	5.5
		Zinc	mg/kg	802	5.5
6-__	1	Percent Solid			
		Solids, percent	%	89.9	
7-__	1	Metals in Solids by ICP-AES			
		Cadmium	mg/kg	8.0	1.3
		Barium	mg/kg	183	2.6
		Arsenic	mg/kg	10.4	6.6
		Zinc	mg/kg	926	6.6
		Lead	mg/kg	436 J	6.6
7-__	1	Percent Solid			
		Solids, percent	%	74.2	

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Memo From: Barry Evans, EPA Lab
Telephone: (913) 551-5144

Reference 50

HRS Analysis Results Supplement

07/30/2012

ASR Number: 3283

This report supplements the information contained in the Transmittal of Sample Analysis Results for ASR 3283 sent to Eddie McGlasson on 05/24/2007 for: EMA78Q00 - United Zinc No. 1 site sampling. The transmittal contains the explanation of codes, units, and qualifiers; sample information; analysis information and comments; and the analytical results. The RL in this supplement is the laboratory's reporting limit for that analyte with any dilution factor, volume adjustment, or percent solids for that sample analysis taken into account and is sometimes called the sample quantitation limit, SQL.

Sample	Analysis / Analyte		Units	Result	RL
1-__	1	Metals in Solids by ICP-AES			
		Zinc	mg/kg	31.3	5.2
		Cadmium	mg/kg	2.7	1.0
		Arsenic	mg/kg	5.2 U	5.2
		Barium	mg/kg	110	2.1
		Lead	mg/kg	14.8	5.2
1-__	1	Percent Solid			
		Solids, percent	%	96.2	
2-__	1	Metals in Solids by ICP-AES			
		Arsenic	mg/kg	7.3	5.3
		Barium	mg/kg	254	2.1
		Cadmium	mg/kg	6.8	1.1
		Zinc	mg/kg	76.4	5.3
		Lead	mg/kg	31.1	5.3
2-__	1	Percent Solid			
		Solids, percent	%	93.3	
3-__	1	Metals in Solids by ICP-AES			
		Lead	mg/kg	620	6.2
		Cadmium	mg/kg	8.3	1.2
		Zinc	mg/kg	1210	6.2
		Barium	mg/kg	204	2.5
		Arsenic	mg/kg	20.9	6.2
3-__	1	Percent Solid			
		Solids, percent	%	79.7	
4-__	1	Metals in Solids by ICP-AES			
		Lead	mg/kg	755	6.2
		Zinc	mg/kg	1220	6.2
		Arsenic	mg/kg	8.1	6.2
		Cadmium	mg/kg	9.0	1.2
		Barium	mg/kg	172	2.5
4-__	1	Percent Solid			
		Solids, percent	%	79.4	

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Memo From: Barry Evans, EPA Lab
Telephone: (913) 551-5144

Reference 50

ASR Number: 3283 **HRS Analysis Results Supplement** 07/30/2012

Sample	Analysis / Analyte	Units	Result	RL
5-__	1 Metals in Solids by ICP-AES			
	Zinc	mg/kg	329	6.0
	Lead	mg/kg	143	6.0
	Arsenic	mg/kg	6.0 U	6.0
	Barium	mg/kg	161	2.4
	Cadmium	mg/kg	4.1	1.2
5-__	1 Percent Solid			
	Solids, percent	%	82.8	
6-__	1 Metals in Solids by ICP-AES			
	Cadmium	mg/kg	6.6	1.1
	Lead	mg/kg	337	5.7
	Barium	mg/kg	123	2.3
	Arsenic	mg/kg	5.7 U	5.7
	Zinc	mg/kg	816	5.7
6-__	1 Percent Solid			
	Solids, percent	%	85.1	
7-__	1 Metals in Solids by ICP-AES			
	Lead	mg/kg	364	7.1
	Cadmium	mg/kg	8.2	1.4
	Barium	mg/kg	186	2.8
	Arsenic	mg/kg	7.9	7.1
	Zinc	mg/kg	752	7.1
7-__	1 Percent Solid			
	Solids, percent	%	69.8	
8-__	1 Metals in Solids by ICP-AES			
	Cadmium	mg/kg	9.9	1.2
	Barium	mg/kg	198	2.4
	Arsenic	mg/kg	13.3	6.0
	Zinc	mg/kg	1520	6.0
	Lead	mg/kg	671	6.0
8-__	1 Percent Solid			
	Solids, percent	%	81.8	

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HRS Analysis Results Supplement

07/30/2012

ASR Number: 3284

This report supplements the information contained in the Transmittal of Sample Analysis Results for ASR 3284 sent to Eddie McGlasson on 06/25/2007 for: EMA78Q00 - United Zinc No. 1 site sampling. The transmittal contains the explanation of codes, units, and qualifiers; sample information; analysis information and comments; and the analytical results. The RL in this supplement is the laboratory's reporting limit for that analyte with any dilution factor, volume adjustment, or percent solids for that sample analysis taken into account and is sometimes called the sample quantitation limit, SQL.

Sample	Analysis / Analyte		Units	Result	RL
1-__	1	Metals in Solids by ICP-AES			
		Barium	mg/kg	180	25.2
		Lead	mg/kg	664 J	1.26
		Cadmium	mg/kg	6.15	0.629
		Zinc	mg/kg	1090 J	7.55
		Arsenic	mg/kg	19.4	1.26
2-__	1	Metals in Solids by ICP-AES			
		Cadmium	mg/kg	5.08	0.596
		Barium	mg/kg	211	23.8
		Arsenic	mg/kg	9.17	1.19
		Lead	mg/kg	481 J	1.19
		Zinc	mg/kg	1250 J	7.15
3-__	1	Metals in Solids by ICP-AES			
		Arsenic	mg/kg	12.0	1.07
		Zinc	mg/kg	1460 J	6.40
		Cadmium	mg/kg	6.11	0.534
		Lead	mg/kg	630 J	1.07
		Barium	mg/kg	192	21.3
4-__	1	Metals in Solids by ICP-AES			
		Barium	mg/kg	234	24.2
		Arsenic	mg/kg	10.9	1.21
		Cadmium	mg/kg	11.5	0.606
		Zinc	mg/kg	2690 J	7.27
		Lead	mg/kg	487 J	1.21
5-__	1	Metals in Solids by ICP-AES			
		Cadmium	mg/kg	6.60	0.609
		Zinc	mg/kg	1750 J	7.31
		Barium	mg/kg	192	24.4
		Lead	mg/kg	636 J	1.22
		Arsenic	mg/kg	15.1	1.22
6-__	1	Metals in Solids by ICP-AES			
		Barium	mg/kg	242	23.8
		Arsenic	mg/kg	16.1	1.19
		Lead	mg/kg	733 J	1.19

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Sample	Analysis / Analyte		Units	Result	RL
6-__	1	Metals in Solids by ICP-AES			
		Zinc	mg/kg	2390 J	7.13
		Cadmium	mg/kg	8.89	0.595
7-__	1	Metals in Solids by ICP-AES			
		Arsenic	mg/kg	10.4	1.28
		Lead	mg/kg	308 J	1.28
		Zinc	mg/kg	1450 J	7.66
		Cadmium	mg/kg	5.42	0.639
		Barium	mg/kg	175	25.5

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Memo From: Barry Evans, EPA Lab
Telephone: (913) 551-5144

HRS Analysis Results Supplement

07/30/2012

ASR Number: 3285

This report supplements the information contained in the Transmittal of Sample Analysis Results for ASR 3285 sent to Eddie McGlasson on 07/13/2007 for: EMA78Q00 - United Zinc No. 1 site sampling. The transmittal contains the explanation of codes, units, and qualifiers; sample information; analysis information and comments; and the analytical results. The RL in this supplement is the laboratory's reporting limit for that analyte with any dilution factor, volume adjustment, or percent solids for that sample analysis taken into account and is sometimes called the sample quantitation limit, SQL.

Sample	Analysis / Analyte		Units	Result	RL
1-__	1	Metals in Solids by ICP-AES			
		Cadmium	mg/kg	7.3	1.3
		Zinc	mg/kg	3000	6.3
		Arsenic	mg/kg	19.0	6.3
		Barium	mg/kg	231	2.5
		Lead	mg/kg	1340	6.3
1-__	1	Percent Solid			
		Solids, percent	%	67.6	
2-__	1	Metals in Solids by ICP-AES			
		Arsenic	mg/kg	13.3	5.4
		Cadmium	mg/kg	5.8	1.1
		Zinc	mg/kg	1410	5.4
		Barium	mg/kg	195	2.2
		Lead	mg/kg	408	5.4
2-__	1	Percent Solid			
		Solids, percent	%	83.5	
3-__	1	Metals in Solids by ICP-AES			
		Arsenic	mg/kg	12.1	6.3
		Lead	mg/kg	613	6.3
		Cadmium	mg/kg	5.5	1.3
		Zinc	mg/kg	1940	6.3
		Barium	mg/kg	144	2.5
3-__	1	Percent Solid			
		Solids, percent	%	72.4	
4-__	1	Metals in Solids by ICP-AES			
		Lead	mg/kg	551	4.9
		Cadmium	mg/kg	3.1	1.0
		Barium	mg/kg	223	2.0
		Zinc	mg/kg	1080	4.9
		Arsenic	mg/kg	11.4	4.9
4-__	1	Percent Solid			
		Solids, percent	%	83.1	

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Memo From: Barry Evans, EPA Lab
Telephone: (913) 551-5144

ASR Number: 3285 **HRS Analysis Results Supplement** 07/30/2012

Sample	Analysis / Analyte		Units	Result	RL
5-__	1	Metals in Solids by ICP-AES			
		Barium	mg/kg	190	2.2
		Zinc	mg/kg	2040	5.4
		Arsenic	mg/kg	53.1	5.4
		Lead	mg/kg	2030	5.4
		Cadmium	mg/kg	4.6	1.1
5-__	1	Percent Solid			
		Solids, percent	%	83.3	
6-__	1	Metals in Solids by ICP-AES			
		Cadmium	mg/kg	5.6	1.0
		Zinc	mg/kg	1970	4.8
		Arsenic	mg/kg	9.6	4.8
		Barium	mg/kg	245	1.9
		Lead	mg/kg	479	4.8
6-__	1	Percent Solid			
		Solids, percent	%	84.0	
7-__	1	Metals in Solids by ICP-AES			
		Lead	mg/kg	59.0	4.9
		Cadmium	mg/kg	1.0 U	1.0
		Barium	mg/kg	131	2.0
		Arsenic	mg/kg	6.4	4.9
		Zinc	mg/kg	130	4.9
7-__	1	Percent Solid			
		Solids, percent	%	87.1	
8-__	1	Metals in Solids by ICP-AES			
		Cadmium	mg/kg	9.3	1.1
		Barium	mg/kg	181	2.2
		Arsenic	mg/kg	19.0	5.5
		Zinc	mg/kg	3100	5.5
		Lead	mg/kg	1180	5.5
8-__	1	Percent Solid			
		Solids, percent	%	82.3	

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Tetra Tech EM Inc.

Record of Communication

Date: August 17, 2012	
Initiated by: Kumud Pyakuryal *Title*: Documentation Record Preparer *Firm/Agency*: Tetra Tech, Inc. *Telephone*: (913) 412-1778 *Time*: 11:00AM	*Contact*: Rick Claytor, *Title*: United Zinc Removal Action Project Manager *Firm/Agency*: Tetra Tech Region 7 START Team Member *Telephone*: (913) 908-4649

Subject: Sample 3152-006 Collected From Cell #7 within the Jefferson Elementary School property at the Former United Zinc and Associated Shelters Site (CERCLIS ID: **KSN000705026)**

Summary of Conversation:

I contacted Rick Claytor, Tetra Tech Superfund Technical Assessment and Response Team removal manager, regarding the collection time and depth of sample 3152-006, analyzed under the EPA Region 7 Laboratory Analytical Service Request Number 3152, at the abovementioned site. A summary of discussion is presented below:

- The removal manager stated that sample 3152-006 represents a post-excavation sample from soil remaining on the Jefferson Elementary School property, within the top 24 inches of the ground surface.
- The removal manager stated that sample 3152-006 was indeed collected at the Jefferson Elementary School yard, in Cell #7 in August 2006 and no known subsequent removal activities or excavations occurred at this cell location.
- The removal manager stated that in exceptional cases excavation at property cells was discontinued even when the X-ray Fluorescence readings were above the site action level of 400 parts per million as was the case at this cell location. No further removal or excavation was undertaken when physical conditions such as utility pipes or tree roots were encountered. Therefore, as noted in the property field sheet found in the Removal Action Report (included as Reference 40 of the documentation record), Cell #7 was excavated to 12 inches bgs only.

Tetra Tech EM Inc.

Record of Communication	
Date: August 17, 2012	
Initiated by: Kumud Pyakuryal *Title*: Documentation Record Preparer *Firm/Agency*: Tetra Tech, Inc. *Telephone*: (913) 412-1778 *Time*: 1:30 PM	*Contact*: Courtney Orth, *Title*: School Secretary *Firm/Agency*: McKinley Elementary School, Iola, Kansas *Telephone*: (620) 365-4860
Subject: Number of Students at the McKinley Elementary School, Iola, Kansas	
Summary of Conversation: I contacted Courtney Orth regarding the number of students currently attending the McKinley Elementary School. She said the school currently has 136 students this year.	